

National Park Service  
U.S. Department of the Interior

Assateague Island National Seashore  
Maryland / Virginia



# ASSATEAGUE ISLAND NATIONAL SEASHORE

## *Personal Watercraft Use Environmental Assessment*





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*April 2002*





## Summary

Assateague Island National Seashore consists of three public areas: Assateague Island National Seashore is managed by the National Park Service (NPS); Chincoteague National Wildlife Refuge is managed by the U.S. Fish and Wildlife Service; and Assateague State Park is managed by the Maryland Department of Natural Resources. Assateague Island National Seashore encompasses a 37-mile-long barrier island on the Atlantic coast, in Worcester County, Maryland, and Accomack County, Virginia. It includes approximately 39,700 acres of land and water within its jurisdictional boundaries, including the 9,021-acre Chincoteague National Wildlife Refuge. Together, these agencies manage a seashore ecosystem of wildlands and wildlife, as well as outdoor recreational activities, including the use of personal watercraft (PWC).

The purpose of and the need for taking action is to evaluate a range of alternatives and strategies for the management of PWC use at Assateague Island National Seashore in order to ensure the protection of park resources and values while offering recreational opportunities as provided for in the national seashore's enabling legislation, purpose, mission, and goals. Upon completion of this process in accordance with the National Environmental Policy Act (NEPA), the National Park Service may either take action to adopt special regulations to manage PWC use at Assateague Island National Seashore, or it may discontinue PWC use at this park unit.

## BACKGROUND

More than one million personal watercraft are estimated to be in operation today in the United States. Sometimes referred to as "Jet skis" or "wet bikes," these vessels use an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. They are used for enjoyment, particularly for stunt-like maneuvers, and they are designed for speeds up to 70 mph. PWC recreation is the fastest growing segment of the boating industry, representing over one-third of total sales. While PWC use remains a relatively new recreational activity, it has occurred in 32 of the 87 national park system units that allow motorized boating.

After studies in Everglades National Park showed that PWC use resulted in damage to vegetation, adversely impacted shorebirds, and disturbed the life cycles of other wildlife, the National Park Service prohibited PWC use by a special regulation at the park in 1994. In recognition of its duties under its Organic Act and NPS *Management Policies*, as well as increased awareness and public controversy about PWC use, the National Park Service subsequently reevaluated its methods of PWC regulation. Historically, the National Park Service had grouped personal watercraft with all vessels; thus, PWC use was allowed when the unit's superintendent's compendium allowed the use of other vessels. Later the Park Service closed seven units to PWC use through the implementation of horsepower restrictions, general management plan revisions, and park-specific regulations such as those promulgated by Everglades National Park.

In May 1998 the Bluewater Network filed a petition urging the National Park Service to initiate a rulemaking process to prohibit PWC use throughout the national park system. In response to the petition, the Park Service issued an interim management policy requiring superintendents of parks where PWC use can occur but had not yet occurred to close the unit to such use until the rule was finalized. The Park Service envisioned the servicewide regulation as an opportunity to evaluate impacts from PWC use before authorizing the use. On March 21, 2000, the National Park Service

issued a regulation prohibiting PWC use in most units and required 21 units to determine the appropriateness of continued PWC use.

In response to the PWC final regulation, Bluewater Network sued the National Park Service, challenging the National Park Service's decision to allow continued PWC use in 21 units while prohibiting PWC use in other units. In response to the suit, the National Park Service and the environmental group negotiated a settlement. While 21 units can continue PWC use in the short term, each of those parks desiring to continue long-term PWC use must promulgate a park-specific special regulation in 2002. In addition, the settlement stipulates that the National Park Service must base its decision to issue a park-specific special regulation to continue PWC use through an environmental analysis conducted in accordance with the National Environmental Policy Act. The NEPA analysis at a minimum, according to the settlement, must evaluate PWC impacts on water quality, air quality, soundscapes, wildlife, wildlife habitat, shoreline vegetation, visitor conflicts, and visitor safety.

## **ALTERNATIVES CONSIDERED**

This environmental assessment evaluates four alternatives concerning the use of personal watercraft at Assateague Island National Seashore.

- Alternative A would continue the current management and regulation of PWC use, as provided for in the Park Superintendent's Compendium, and a special regulation would be adopted. The Park Superintendent's Compendium prohibits PWC use within the boundary of Assateague Island National Seashore except for specific areas in the Ocean City Inlet, Sinepuxent Bay, and Chincoteague Bay. This is considered the "baseline" alternative to compare against other management strategies including closure of the unit to PWC use.
- Alternative B would be the same as alternative A, except Sinepuxent Bay within the national seashore boundary would be closed to PWC use.
- Alternative C would be the same as alternative B except PWC users would have to observe no-wake speeds when accessing landing points within the national seashore boundary.
- The no-action alternative would discontinue all PWC use within the national seashore beginning in April 2002.

The preferred alternative and the environmentally preferred alternative is alternative B. Both the Ocean City Inlet and Little Beach areas have physical and biological characteristics that minimize the potential for adverse impacts to park resources and values, and both are located immediately adjacent to population centers that currently experience high levels of boat traffic. The intended effect is to provide island access for persons wanting to use a personal watercraft to travel to the national seashore or for persons for whom a personal watercraft is the only form of water access to Assateague Island. Sinepuxent Bay was re-evaluated against the resource protection and public use issues described in this assessment and was found to be comparable to the majority of park waters, and it does not possess the physical and biological characteristics that would minimize the potential for adverse impacts.

## **ENVIRONMENTAL CONSEQUENCES**

Impacts of the four PWC management alternatives were assessed in accordance with *Director's Order #12: Conservation Planning, Environmental Impact Analysis and Decision-making*. The *Director's Order #12 Handbook* requires that impacts to park resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision-makers to understand the implications

of those impacts in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists.

To determine impacts, methodologies were identified to measure the change in park resources that would occur with the implementation of the PWC management alternatives. Thresholds were established for each impact topic to help understand the severity and magnitude of changes in resource conditions, both adverse and beneficial.

Each PWC management alternative was compared to a baseline to determine the context, duration, and intensity of resource impacts. The baseline, for purposes of impact analysis, is the continuation of PWC use and current management projected over the next 10 years (alternative A).

Table A summarizes the results of the impact analysis for the impact topics that were assessed. The analysis considered a 10-year period (2002–2012).

**TABLE A: SUMMARY OF THE IMPACT ANALYSIS**

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
<b>Water Quality</b>	For human health benchmarks, minor to moderate impacts for benzene and MTBE. Rapid dispersion of pollutants in the Ocean City Inlet by intense flushing action would substantially reduce health-related concerns. The short half-life of benzene would further reduce its estimated impacts. (Negligible impacts for all ecotoxicological benchmarks.) Cumulative effects: Moderate to major impacts in 2002 for benzene and MTBE, decreasing to minor to moderate by 2012, with intense flushing reducing health-related concerns. Monitoring for benzene and MTBE should be done in all areas to verify projected levels and decide whether to require other mitigating measures (such as four-stroke engines).	Similar to alternative A in Ocean City Inlet and Little Beach. Minor to moderate impacts for benzene and MTBE in 2002, decreasing to minor by 2012 (benzene could be moderate). Beneficial impacts in Sinepuxent Bay from prohibiting PWC use. (Negligible impacts for all ecotoxicological benchmarks.) Cumulative effects: Moderate to major impacts in 2002 for MTBE and benzene, decreasing to minor to moderate by 2012. Monitoring for benzene and MTBE similar to alternative A.	Negligible impacts in Ocean City Inlet and Little Beach, and beneficial, long-term impacts in Sinepuxent Bay. (Negligible impacts for all ecotoxicological benchmarks.) Cumulative effects: For benzene and MTBE, at Little Beach minor to moderate impacts in 2002 and 2012; at Ocean City Inlet moderate to major impacts in 2002, decreasing to moderate by 2012. Negligible impacts for all other pollutants.	Beneficial impact of stopping PWC use within the national seashore. Cumulative effects: Moderate to major impacts in backbay waters, and negligible to minor impacts in Ocean City Inlet and Little Beach.
<b>Air Quality</b>				
• Impacts to Human Health	Minor adverse impacts for carbon monoxide (CO) and negligible impacts for other pollutants. Cumulative effects: Moderate impacts for CO; negligible to minor impacts for other pollutants.	Minor impacts for CO and negligible impacts for the other pollutants. By 2012 negligible impact levels. Cumulative effects: Moderate impacts for CO; negligible to minor impacts for other pollutants.	Negligible impacts for all criteria pollutants. Cumulative effects: Minor impacts for CO in 2002 and 2012; negligible impacts for other pollutants.	Negligible beneficial impacts on air quality. Cumulative effects: Minor impacts for CO; negligible impacts for other pollutants.

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
• Impacts on Air Quality Related Values	Negligible impacts to visibility, wildlife, and plants. Cumulative effects: Negligible to minor impacts, decreasing to negligible by 2012.	Same as alternative A.	Same as alternative A except cumulative effects negligible for all pollutants.	Beneficial impacts from banning PWC use. Cumulative effects: Negligible impacts.
<b>Sound-scapes</b>	Minor impacts at the northern landing area and minor to moderate impacts at Sinepuxent Bay and Little Beach. Cumulative effects: Negligible to moderate impacts, depending on location.	Beneficial impacts in Sinepuxent Bay; minor impacts at Ocean City Inlet, and minor to moderate impacts at Little Beach. Cumulative effects: Same as alternative A, except in Sinepuxent Bay minor impacts from other noise sources inside and outside the boundary.	Beneficial impacts in Sinepuxent Bay (similar to alternative B). Negligible to minor impacts at Ocean City Inlet and Little Beach. Cumulative effects: Negligible to minor impacts, depending on location.	Negligible beneficial impacts at the northern landing area, minor beneficial impacts at Little Beach, beneficial impacts in Sinepuxent Bay. Cumulative effects: Negligible to minor impacts.
<b>Wildlife and Wildlife Habitat</b>	Minor impacts near the northern landing area because wildlife species are sensitive to a high level of noise and human activity. Minor to moderate impacts in Sinepuxent Bay and near the southern landing area because wildlife species less accustomed to high levels of human activity and noise. Cumulative effects: Moderate adverse impacts on a short-term basis.	Minor impacts near the northern landing area, and moderate impacts near the southern landing area, similar to alternative A. Negligible impacts in Sinepuxent Bay. Cumulative effects: Moderate adverse impacts, similar to alternative A.	Negligible impacts at the northern and the southern landing areas. Cumulative effects: Minor, short-term impacts.	Minor beneficial impacts. Cumulative effects: Minor, short-term impacts.
<b>Aquatic Fauna</b>	Minor to moderate impacts, particularly in Ocean City Inlet and Sinepuxent Bay. Cumulative effects: Moderate, long-term impacts in Ocean City Inlet, and minor to moderate impacts near the southern landing area.	Beneficial impact in Sinepuxent Bay. Minor to moderate impact in Ocean City Inlet and at Little Beach. Cumulative effects: Similar to alternative A except long-term, beneficial impact in Sinepuxent Bay.	Beneficial impact in Sinepuxent Bay; minor impact at other locations. Cumulative effects: Same as alternative A.	Minor, beneficial, long-term impacts. Cumulative effects: Similar to alternative A except minor beneficial, long-term impacts from banning PWC use.
<b>Threatened, Endangered, or Special Concern Species</b>	Piping plovers, loggerhead sea turtles, and bald eagles not likely to be adversely affected. No effects to the Delmarva fox squirrel or seabeach amaranth. Cumulative effects: Impacts are not likely to adversely affect any species.	Same as alternative A.	Same as alternative A.	Same as alternative A.
<b>Shoreline Vegetation</b>	Minor adverse impacts. Cumulative effects: No impacts at the northern landing; minor impacts at other locations.	Similar to alternative A. Closing Sinepuxent Bay to PWC use would not have a protective effect on shoreline vegetation.	Similar to alternative A. No-wake zones would have no effect on shoreline vegetation, and closing Sinepuxent Bay to PWC use would not have a protective effect on shoreline vegetation.	Minor beneficial effects from banning PWC use. Cumulative effects: Minor impacts.

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
<b>Submerged Aquatic Vegetation</b>	Negligible to minor impacts. Cumulative effects: Negligible to minor impacts.	Negligible impacts in the northern and southern landing areas and beneficial impacts in Sinepuxent Bay. Cumulative effects: Negligible to potentially minor impacts in designated use areas; beneficial impacts in Sinepuxent Bay.	Negligible impacts in the northern and southern landing areas and beneficial impacts in Sinepuxent Bay. Cumulative effects: Negligible impacts; beneficial impacts in Sinepuxent Bay.	Beneficial impacts in Sinepuxent Bay and potential non-delineated SAV beds at the southern end of the island. Cumulative effects: Negligible impacts.
<b>Visitor Experience</b>	Negligible to moderate impacts, depending on location and seasonal variations in use. Cumulative effects: Negligible impacts.	Negligible to moderate impacts, depending on location and seasonal variations in use, as described under alternative A, except reduced potential for PWC-related conflicts in Sinepuxent Bay. Cumulative effects: Negligible impacts, with little noticeable change in visitor experiences.	Negligible to minor impacts. Cumulative effects: Similar to alternative A.	Negligible impacts for non-PWC users, minor impacts for PWC users. Cumulative effects: Minor impacts in areas where PWC use relocated.
<b>Visitor Safety</b>	Negligible to moderate impacts due to increased congestion from all boat types.	Negligible impacts within Sinepuxent Bay; negligible to moderate impacts at the northern and southern landing areas, and outside the national seashore boundary.	Negligible impacts within Sinepuxent Bay; negligible to possibly minor impacts from no-wake restrictions at the northern and southern landing areas. Negligible to minor impacts in the Ocean City Inlet and in Sinepuxent Bay outside NPS waters.	Negligible to minor impacts because other uses would continue.
<b>Socioeconomic Environment</b>	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.
<b>National Seashore Operations and Management</b>				
<b>Enforcement Needs</b>	Minor to moderate, long-term impacts due to additional law enforcement needs.	Same as alternative A.	Same as alternative A.	Minor to moderate, long-term impacts due to enforcing PWC restrictions.
<b>Conflict with State and Local Ordinances</b>	No effect on state and local ordinances.	Same as alternative A.	Same as alternative A.	Park regulations more restrictive than state or local regulations, but no overall effect.

No natural or cultural resources would be impaired under any alternative.



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# PURPOSE OF AND NEED FOR ACTION

Assateague Island National Seashore consists of three public areas: Assateague Island National Seashore is managed by the National Park Service (NPS); Chincoteague National Wildlife Refuge is managed by the U.S. Fish and Wildlife Service; and Assateague State Park is managed by the Maryland Department of Natural Resources (see Location map). Assateague Island National Seashore encompasses a 37-mile-long barrier island on the Atlantic coast, in Worcester County, Maryland, and Accomack County, Virginia. It includes approximately 39,700 acres of land and water within its jurisdictional boundaries, including the 9,021-acre Chincoteague National Wildlife Refuge. Together, these agencies manage a seashore ecosystem of wildlands and wildlife, as well as outdoor recreational activities, including the use of personal watercraft (PWC).

More than one million personal watercraft\* are estimated to be in operation today in the United States. Sometimes referred to as “Jet skis” or “wet bikes,” these vessels use an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. They are used for enjoyment, particularly for stunt-like maneuvers, and they are designed for speeds up to 70 mph. PWC recreation is the fastest growing segment of the boating industry, representing over one-third of total sales.

The National Park Service maintains that PWC use emerged and gained popularity in park units before it could initiate and complete a “full evaluation of the possible impacts and ramifications.” While **PWC** use remains a relatively new recreational activity, it has occurred in 32 of the 87 park units that allow motorized boating.

The National Park Service first began to study PWC use in Everglades National Park. The studies showed that PWC use over emergent vegetation, shallow grass flats, and mud flats commonly used by feeding shorebirds damaged the vegetation, adversely impacted the shorebirds, and disturbed the life cycles of other wildlife. Consequently, managers at Everglades determined that PWC use remained inconsistent with the resources, values, and purposes for which the **park** was established. In 1994, the National Park Service prohibited PWC use by a special regulation at the park (59 FR 58781).

Other public entities have taken steps to limit, and even to ban, PWC use in certain waterways as national researchers study more about the effects of PWC use. At least 34 states have either implemented or have considered regulating the use and operation of personal watercraft (63 FR 49314). Similarly, various federal agencies, including the Fish and Wildlife Service and the National Oceanic and Atmospheric Agency, have managed personal watercraft differently than other classes of motorized watercraft.

Specifically, the National Oceanic and Atmospheric Agency regulate the use of PWC in most **national** marine sanctuaries. The regulation resulted in a court case where the Court of Appeals for the District of Columbia declared such PWC-specific management valid. In *Personal Watercraft Industry Association v. Department of Commerce*, 48 F.3d 540 (D. C. Cir. 1995), the court ruled that an agency

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\* Personal watercraft, as defined in 36 CFR §1.4(a) (2000), refers to a vessel, usually less than 16 feet in length, which uses an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. The vessel is intended to be operated by a person or persons sitting, standing, or kneeling on the vessel, rather than within the confines of the hull. The length is measured from end to end over the deck excluding sheer, meaning a straight line measurement of the overall length from the foremost part of the vessel to the aftermost part of the vessel, measured parallel to the centerline. Bow sprits, bumpkins, rudders, outboard motor brackets, and similar fittings or attachments, are not included in the measurement. Length is stated in feet and inches.

can discriminate and manage one type of vessel (specifically personal watercraft) differently than other vessels if the agency explains its reasons for the differentiation.

In February 1997 the Tahoe Regional Planning Agency, the governing body charged with ensuring no derogation of Lake Tahoe's water quality, voted unanimously to ban all two-stroke, internal combustion engines, including personal watercraft, because of their effects on water quality. Lake Tahoe's ban began in 2000.

In recognition of its duties under its Organic Act and the National Park Service *Management Policies*, as well as increased awareness and public controversy, the National Park Service reevaluated its methods of PWC regulation. Historically, the National Park Service grouped personal watercraft with all vessels; thus, people could use personal watercraft when the unit's superintendent's compendium allowed the use of other vessels. Later the National Park Service closed seven units to PWC use through the implementation of horsepower restrictions, general management plan revisions, and park specific regulations such as those promulgated at Everglades National Park.

In May 1998 the Bluewater Network, a coalition of more than 70 organizations representing more than 4 million Americans, filed a petition urging the National Park Service to initiate the rulemaking process to prohibit PWC use throughout the national park system. In response to the petition, the Park Service issued an interim management policy requiring superintendents of parks where PWC use can occur but where they had never been used to close the unit to PWC use until the rule was finalized. In addition, the National Park Service proposed a specific PWC regulation premised on the notion that personal watercraft differ from conventional watercraft in terms of design, use, safety record, controversy, visitor impacts, resource impacts, horsepower to vessel length ratio, and thrust capacity (63 FR 49312-17, Sept. 15, 1998).

The National Park Service envisioned the service-wide regulation as an opportunity to evaluate impacts from PWC use before authorizing the use. The preamble to the servicewide regulation calls the regulation a "conservative approach to managing PWC use" considering the resource concerns, visitor conflicts, visitor enjoyment, and visitor safety. During a 60-day comment period the National Park Service received nearly 20,000 comments.

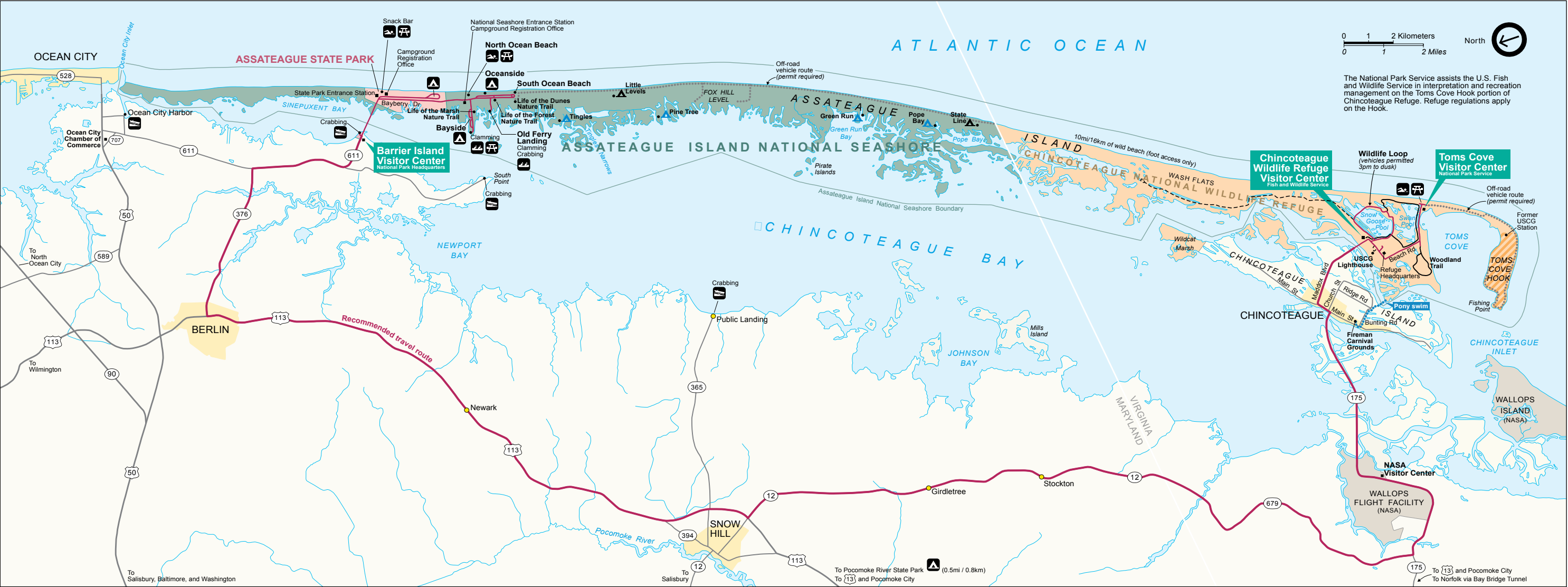
As a result of public comments and further review, the National Park Service promulgated an amended regulation that prohibited PWC use in most units and required the remaining units to determine the appropriateness of continued PWC use (36 CFR 3.24(a), 2000; 65 FR 15077-90, Mar. 21, 2000). Specifically, the regulation allowed the National Park Service to designate PWC areas and to continue their use by promulgating a special regulation in 11 units, including Assateague Island National Seashore, and by amending the superintendent's compendiums in 10 other units (36 CFR 3.24(b), 2000). The National Park Service based the distinction between designation methods on each unit's degree of motorized watercraft use.

In response to the PWC final regulation, Bluewater Network sued the National Park Service under the Administrative Procedures Act and its Organic Act. The organization challenged the National Park Service's decision to allow continued PWC use in 21 units while prohibiting PWC use in other units. In addition, the organization disputed the National Park Service's decision to allow 10 units to continue PWC use after 2002 by making entries in the superintendent's compendiums, which would not require the opportunity for public input through a notice and a comment rulemaking process.

# Assateague Island National Seashore

Maryland / Virginia

## Location Map



United States Department of the Interior / National Park Service WASO/April '02/622-20019

<ul style="list-style-type: none"> <li> Public campground</li> <li> Campsite: backpack in only</li> <li> Campsite: backpack or canoe in</li> <li> Picnic area</li> <li> Lifeguarded beach</li> </ul>	<ul style="list-style-type: none"> <li> Boat launch</li> <li> Canoe access</li> </ul>	<ul style="list-style-type: none"> <li> National Park Service lands</li> <li> National Wildlife Refuge lands</li> <li> State Park lands</li> </ul>	<ul style="list-style-type: none"> <li> Recommended travel route The 50-mile distance between the north and south ends of the island takes about 1 1/4 hours to drive. We recommend the route shown in red on the map.</li> <li> Refuge area closed to public March 15 through August 31</li> </ul>	<ul style="list-style-type: none"> <li> Hiking trail</li> <li> Hiker/Biker trail (paved)</li> <li> Off-road vehicle route (permit required)</li> </ul>
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Further, the environmental group claimed that because PWC use causes water and air pollution, generates increased noise levels, and pose public safety threats, the National Park Service acted arbitrarily and capriciously when making the challenged decisions.

In response to the suit, the National Park Service and the environmental group negotiated a settlement. The resulting settlement agreement, signed by the judge on April 12, 2001, changed portions of the National Park Service's PWC rule. While 21 units can continue PWC use in the short term, each of those parks desiring to continue long-term PWC use must promulgate a park-specific special regulation in 2002. In addition, the settlement stipulates that the National Park Service must base its decision to issue a park-specific special regulation to continue PWC use through an environmental analysis conducted in accordance with the National Environmental Policy Act (NEPA). The NEPA analysis at a minimum, according to the settlement, must evaluate PWC impacts on water quality, air quality, soundscapes, wildlife, wildlife habitat, shoreline vegetation, visitor conflicts, and visitor safety.

In 2001 the National Park Service adopted its new management policy for personal watercraft. The policy prohibits PWC use in certain park system units unless their use remains appropriate for the specific park unit (*Management Policies 2001*, sec. 8.2.3.3). The policy statement authorizes the use based on the park's enabling legislation, resources, values, other park uses, and overall management strategies.

## **PURPOSE OF AND NEED FOR ACTION**

The purpose of and the need for taking action is to evaluate a range of alternatives and strategies for the management of PWC use at Assateague Island National Seashore in order to ensure the protection of park resources and values while offering recreational opportunities as provided for in the national seashore's enabling legislation, purpose, mission, and goals. Upon completion of the NEPA process, the National Park Service may either take action to adopt special regulations to manage PWC use at Assateague Island National Seashore, or it may discontinue PWC use at this park unit, as allowed for in the National Park Service March 2000 rule.

This environmental assessment evaluates four alternatives concerning the use of personal watercraft at Assateague Island National Seashore. The alternatives considered include three alternatives to continue PWC use under certain conditions: alternative A would continue use as currently managed under a special regulation; alternative B would add geographic restrictions; and alternative C would adopt other management strategies, in addition to geographic restrictions. In addition, a no-action alternative is considered that would discontinue all PWC use within the national seashore.

## **SCOPE OF THE ANALYSIS**

Watercraft use in Assateague Island National Seashore has likely occurred since this national park system unit was established in 1965. NPS staff noted that PWC use began to increase annually in the 1990s, particularly in the latter part of the decade. Since some effects of PWC use are similar to other watercraft and therefore difficult to distinguish, the focus of this action is in support of decisions and rulemaking specific to PWC use. However, while the settlement agreement and need for action has defined the scope of this environmental assessment, NEPA regulations require an analysis of cumulative effects on resources of all past, present and reasonably foreseeable actions when added to the effects of the proposal (40 CFR 1508.7, 2000)). The scope of this analysis, therefore, is to define

management alternatives specific to PWC use, in consideration of other uses, actions, and activities cumulatively affecting park resources and values.

## **PARK PURPOSE AND SIGNIFICANCE**

National park system units are established by Congress to fulfill specified purposes, based on the park's unique and "significant" resources. A park's purpose, as established by Congress, is the fundamental building block for its decisions to conserve resources while providing for the "enjoyment of future generations."

The enabling legislation for Assateague Island National Seashore, its purpose and significance, and its broad mission goals are summarized in this section and are taken from the national seashore's enabling legislation, the 1982 *General Management Plan*, and the 2000 *Strategic Plan* (NPS 2000d). In addition, the national seashore's purpose, significance, and management objectives are all linked to the impairment findings that are made in the NEPA process, as stated in section 1.4.5 of the National Park Service *Management Policies 2001* (NPS 2001c).

**Establishment** — Congress established Assateague Island National Seashore on September 21, 1965 (Public Law [PL] 89-195). The enabling legislation states,

For the purpose of protecting and developing Assateague Island in the States of Maryland and Virginia and certain adjacent waters and small marsh islands for public outdoor recreation use and enjoyment, the Assateague Island National Seashore . . . shall be established" (16 USC 459f).

The national seashore is a 37-mile barrier island off the coasts of Maryland and Virginia. The park encompasses 39,700 acres and receives with approximately 2 million visitors per year. The original enabling legislation for the national seashore called for an island-long highway and major overnight accommodations within the park. PL 94-578 deleted these requirements in October 1976.

**Administration** — Assateague Island National Seashore is managed under an arrangement that includes a national park system area, a state park area, and a national wildlife refuge area managed by the U.S. Fish and Wildlife Service. The Chincoteague National Wildlife Refuge was established in 1943 and encompasses almost all of Assateague Island in Virginia and approximately 400 acres in Maryland. The 1965 enabling act for the national seashore provided that the lands and waters of the Chincoteague National Wildlife Refuge would be administered for wildlife refuge purposes.

The national seashore's enabling legislation states

[T]he Secretary shall administer Assateague Island National Seashore for general purposes of public outdoor recreation, including conservation of natural features contributing to public enjoyment. . . . [T]he Secretary may utilize such statutory authorities . . . available to him for the conservation and management of natural resources as he deems appropriate (16 USC 459f-5(a)).

Land and waters in Chincoteague National Wildlife Refuge, which are part of the seashore, shall be administered for refuge purposes, . . . including administration for public recreational uses (16 USC 459f-5(a)).

[T]he Secretary shall develop . . . a comprehensive plan for the protection, management, and use of the seashore, to include . . . measures for the full management of the natural resources and natural ecosystems of the seashore [and] present and proposed uses of the seashore and the lands and waters adjacent . . . which would reasonably be expected to influence the administration, use, and environmental quality of the seashore (16 USC 459f-11(a)(1)-(2)).

**Purpose** — A mission statement for Assateague Island National Seashore is included in its *Strategic Plan*. It is based on the park’s mandated purpose and the park’s primary significance, stating

The Mission of Assateague Island National Seashore is to preserve and protect these unique coastal resources and the natural ecosystem conditions and processes upon which they depend, provide high quality resource based recreational opportunities compatible with resource protection, and educate the public as to the values and significance of the area.

**Significance** — The mission statement also outlines the park’s primary significance:

Assateague Island National Seashore provides a protected enclave for complex plant and animal communities, both terrestrial and aquatic, which characterize the Mid-Atlantic coast, and fully illustrates the natural processes of change which shape the coastal environment. Located within a three-hour drive of the Washington/Baltimore/Philadelphia metropolitan areas, the National seashore offers an unspoiled setting in which to experience the many moods of a dynamic barrier island and pursue a multitude of exceptional recreational opportunities.

## BACKGROUND

### NPS ORGANIC ACT AND MANAGEMENT POLICIES

By enacting the National Park Service Organic Act of 1916, Congress directed the U.S. Department of the Interior and the National Park Service to manage units of the national park system “to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (16 USC 1). The Redwood National Park Expansion Act of 1978 reiterates this mandate by stating that the National Park Service must conduct its actions in a manner that will ensure no “derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress” (16 USC 1a-1).

Despite these mandates, the Organic Act and its amendments afford the National Park Service latitude when making resource decisions that balance visitor recreation and resource preservation. By these acts Congress “empowered [the National Park Service] with the authority to determine what uses of park resources are proper and what proportion of the parks resources are available for each use” (*Bicycle Trails Council of Marin v. Babbitt*, 82 F.3d 1445, 1453 (9th Cir. 1996)).

Yet, courts consistently interpreted the Organic Act and its amendments to elevate resources conservation above visitor recreation. *Michigan United Conservation Clubs v. Lujan*, 949 F.2d 202, 206 (6th Cir. 1991) states, “Congress placed specific emphasis on conservation.” The *National Rifle Ass’n of America v. Potter*, 628 F.Supp. 903, 909 (D.D.C. 1986) states, “In the Organic Act Congress speaks of but a single purpose, namely, conservation.” The NPS *Management Policies* also recognize that resource conservation takes precedence over visitor recreation. The policy dictates “when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant” (*Management Policies 2001*, sec. 1.4.3).

Because conservation remains predominant, the National Park Service seeks to avoid or to minimize adverse impacts on park resources and values. Yet, the National Park Service has discretion to allow negative impacts when necessary (*Management Policies 2001*, sec. 1.4.3). However, while some actions and activities cause impacts, the National Park Service cannot allow an adverse impact that constitutes a resource impairment (*Management Policies 2001*, sec. 1.4.3). The Organic Act prohibits actions that permanently impair park resources unless a law directly and specifically allows for the

acts (16 USC 1a-1). An action constitutes an impairment when its impacts “harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values” (*Management Policies 2001*, sec. 1.4.4). To determine impairment, the National Park Service must evaluate “the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts” (*Management Policies 2001*, sec. 1.4.4).

Because park units vary based on their enabling legislation, natural resources, cultural resources, and missions, the recreational activities appropriate for each unit and for areas within each unit vary as well. An action appropriate in one unit may impair resources in another unit. Thus, this environmental assessment analyzes the context, duration, and intensity of impacts related to PWC use at Assateague Island National Seashore, as well as potential for resource impairment, as required by *Director’s Order #12: Conservation Planning, Environmental Impact Analysis and Decision-making (DO #12)*.

## **SUMMARY OF RESEARCH ON THE EFFECTS OF PERSONAL WATERCRAFT**

Over the past two decades PWC use in the United States increased dramatically. However, there are conflicting data about whether PWC use is continuing to increase. While the National Transportation Safety Board (NTSB) estimates that retailers sell approximately 200,000 personal watercraft each year and people currently use another 1 million (NTSB 1998); the PWC industry argues that PWC sales have decreased by 50% from 1995 to 2000 (American Watercraft Association [AWA] 2001).

Environmental groups, PWC users and manufacturers, and land managers express differing opinions about the environmental consequences of PWC use, and about the need to manage or to limit this recreational activity. Research conducted on the effects of PWC use is summarized below for water pollution, air pollution, noise, wildlife, vegetation and shoreline erosion, and health and safety.

### **Water Pollution**

The vast majority of PWC in use today are two-stroke, non-fuel-injected engines, which discharge as much as 25% of their gas and oil emissions directly into the water (NPS 1998). Hydrocarbons, benzene, toluene, and xylene are also released, as well as methyl tertiary-butyl ether (MTBE) in states that use this additive. The amount of pollution correctly attributed to PWC use compared to other motorboats and the degree to which PWC use affects water quality remains debatable. As noted in a report by the Oregon Department of Environmental Quality (ODEQ), every waterbody has different conditions (e.g., water temperature, air temperature, water mixing, motorboating use, and winds) that affect the pollutants’ impacts (ODEQ 1999).

A recent study conducted by the California Air Resources Board consisted of a laboratory test designed to comparatively evaluate exhaust emissions from marine and PWC engines, in particular two- and four-stroke engines (California Air Resources Board 2001). The results of this study showed a difference in emissions (in some cases 10 times higher total hydrocarbons in two-stroke engines) between these two types of engines. An exception was air emissions of NO<sub>x</sub> which was higher in four-stroke than two-stroke engines. Concentrations of pollutants (MTBE, benzene, BTEX) in the tested water were consistently higher for two-stroke engines.

In 1996 the Environmental Protection Agency promulgated a rule to control exhaust emissions from new marine engines, including outboards and personal watercraft. Emission controls provide for

increasingly stricter standards beginning in model year 1998 (US EPA 1996a). As a result of the rule, the agency expects a 50% reduction in hydrocarbon emissions from marine engines from present levels by 2020 and a 75% reduction in hydrocarbon emissions by 2025 (US EPA 1996a).

Discharges of MTBE and polyaromatic hydrocarbons (PAH) particularly concern scientists because of their potential to adversely affect the health of people and aquatic organisms. Scientists need to conduct additional studies on PAHs (Allen et al. 1998) and MTBE (NPS 1999), as well as long-term studies on the effect of repeated exposure to low levels of these pollutants (Asplund 2001).

At Lake Tahoe concern about the negative impact on lake water quality and aquatic life caused by the use of two-stroke marine engines led to at least 10 different studies relevant to motorized watercraft in the Tahoe Basin in 1997 and 1998. The results of these studies (Allen et al. 1998) confirmed that (1) petroleum products are in the lakes as a result of motorized watercraft operation, and (2) watercraft powered by carbureted two-stroke engines discharge pollutants at an order of magnitude greater than do watercraft powered by newer technology engines (Tahoe Regional Planning Agency 1999).

On June 25, 1997, the Tahoe Regional Planning Agency adopted an ordinance prohibiting the “discharge of unburned fuel and oil from the operation of watercraft propelled by carbureted two-stroke engines” beginning June 1, 1999. Following the release of an Environmental Assessment in January 1999, this prohibition was made permanent.

## **Air Pollution**

Two-stroke engines that have been conventionally used in personal watercraft emit pollutants such as nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs) that may adversely affect air quality. In areas with high PWC use some air quality degradation likely occurs (US EPA 1996, 2000). Kado et al. (2000) found that two-stroke engines had considerably higher emissions of airborne particulates and PAHs than four-stroke engines tested. It is assumed that the 1996 EPA rule concerning marine engines will substantially reduce air emissions from personal watercraft in the future (US EPA 1996a).

## **Noise**

PWC-generated noise varies from vessel to vessel depending upon many factors. There is no definitive literature describing scientific measurements of PWC noise. Some literature states that all recently manufactured watercraft emit fewer than 80 decibels at 50 feet from the vessel, while other sources attribute levels as high as 102 decibels without specifying distance. None of this literature fully describes the methodology for collecting the data to determine those levels. Because of this, the National Park Service contracted noise measurements of PWC and other boat types in 2001 at Glen Canyon National Recreation Area; preliminary analysis of this data indicates that maximum PWC noise levels at 50 feet were approximately 68 to 78 A-weighted decibels (dBA). Noise levels for other motorboat types measured during that study were approximately 65 to 86 dBA at 50 feet.

Regulations for boating and water use activities established by the National Park Service prohibit vessels from operating at more than 82 dB measured at 82 feet from the vessel (36 CFR 3.7). However, this regulation does not imply that there are no noise impacts from vessels operating below that limit. Noise impacts from PWC use are caused by a number of factors. Noise complaints against PWC use seem to focus as much or more on frequent changes in pitch and sound energy levels due to rapid acceleration, deceleration, jumping into the air, and change of direction, as on noise levels themselves. Noise from human sources, including personal watercraft, can intrude on natural

soundscapes, masking the natural sounds which are an intrinsic part of the environment. This can be especially true in quiet places, such as secluded lakes, coves, river corridors, and backwater areas. Also, PWC use in areas where there are nonmotorized uses (such as canoeing, sailing, fishing or picnicking, and kayaking) can disrupt the “passive” experience of park resources and values.

PWC users tend to operate close to shore, to operate in confined areas, and to travel in groups, making noise more noticeable to other recreationists. Motorboats traveling back and forth in one area at open throttle or spinning around in small inlets also generate complaints about noise levels; however, most other motorboats tend to operate away from shore and to navigate in a straight line, thus being less noticeable (Vlasich 1998).

### **Wildlife Impacts**

Although relatively few studies have specifically examined PWC effects on wildlife, several researchers have documented wildlife disturbances from personal watercraft and motorboats. A study recently completed in Florida examined the distance at which waterbirds are disturbed by both personal watercraft and outboard-powered boats (Rodgers and Schweikert 2002). Flush distances varied from 65 to 160 feet for personal watercraft, and flush distances for most species were greater for motorboats than for personal watercraft 80% of the time. The authors note that PWC use may be more threatening to waterbirds since they can navigate in shallow secluded waterways where birds typically eat and rest.

### **Shoreline and Aquatic Vegetation**

The effects of personal watercraft on shoreline, wetland, and aquatic communities have not been fully studied, and scientists disagree about whether personal watercraft adversely impact shoreline, wetland, or aquatic vegetation. The majority of concern arises from the shallow draft of personal watercraft, allowing them access to shallow areas that conventional motorboats cannot reach. Like other vessels, personal watercraft may destroy grasses that occur in shallow water ecosystems.

### **Erosion Effects**

Some studies have examined the erosion effects of personal watercraft waves, and other studies suggest that personal watercraft may disturb sediments on river or lake bottoms and cause turbidity. Conflicting research exists concerning whether PWC-caused waves result in erosion and sedimentation. PWC wave sizes vary depending on the environment, including the driver’s weight, the number of passengers, and speed.

### **Health and Safety Concerns**

While PWC industry representatives report that PWC accidents decreased in some states in the late 1990s, no other research supports their contention. To the contrary two national studies of PWC accidents and injuries report that personal watercraft pose a clear health and safety risk, primarily to the operators. In the 1990s PWC accidents increased as the popularity of the craft increased. The National Transportation Safety Board reported that in 1996 personal watercraft represented 7.5% of state-registered recreational boats but accounted for 36% of recreational boating accidents. In the same year PWC operators accounted for more than 41% of the people injured in boating accidents. PWC

operators accounted for approximately 85% of the persons injured in accidents studied in 1997 (NTSB 1998). Some manufacturing changes on throttle and steering may reduce potential accidents. For example, on more recent models, Sea-Doo developed an “off-power assisted steering technology” system that assists steering during off-power as well as off-throttle situations. This system is, according to company literature, designed to provide additional maneuverability and improve rate of deceleration (Sea-Doo 2001a).

## **PWC USE AND REGULATION AT ASSATEAGUE ISLAND NATIONAL SEASHORE**

### **National Seashore Visitation and Uses**

Assateague Island National Seashore has between 1.8 and 1.9 million visitors per year, with approximately 1 million of these visitors concentrated in the south end of the seashore. There are 951 parking spaces on the south end, and the beach is usually crowded. Parking is also available on the north end at Assateague State Park and North Ocean Beach. Off-road vehicle permits are available for additional beach access by four-wheel drive vehicles. The majority of visitors come from Maryland, Virginia, Delaware, and Pennsylvania. Weekend visitation is heavy from the Washington/Baltimore metropolitan area.

Assateague Island National Seashore offers a variety of outdoor recreational activities, including swimming, camping, hiking, canoeing and kayaking, boating, bicycling, bird-watching, fishing, clamming, crabbing, shell collection, birding, and off-road vehicle use. Canoeing and kayaking occur on the bayside of Assateague Island National Seashore, and canoe-in campsites are scattered along the bayside (see Location map). The national seashore has a commercial canoeing concession (NPS 2001a).

### **PWC Use**

PWC use within Assateague Island National Seashore has probably occurred since personal watercraft were introduced to the public. Given the park’s proximity to the popular vacation destination of Ocean City, NPS staff have noted that PWC use has increased throughout the 1990s. PWC users are not allowed to launch within the national seashore, and they are restricted to landing in two areas—an area in the Ocean City Inlet on the north end of the island and an area designated as Little Beach on the south end (see Alternative A map). These two areas provide PWC users access to the national seashore from locations outside the park boundary. PWC users may also traverse Sinepuxent Bay but must remain west of the submerged aquatic vegetation (SAV) closure buoys. These restrictions were implemented following the April 2000 ruling (see Appendix A).

It is estimated that 90% of PWC use within the boundary of Assateague Island National Seashore occurred adjacent to the 6-mile long northern end of the island (C. Zimmerman, NPS, pers. comm.). PWC use in the park consists of guided groups (rentals) and privately owned personal watercraft. On the north end of the island, the majority of use of privately owned personal watercraft occurs on the oceanside of the island, where users have been observed using the ebb shoal break for jumping. NPS staff have noted users crossing within the park boundary, a violation of the Park Superintendent’s Compendium; however, these users typically move farther offshore when observed by park staff. Guided groups from Ocean City, Maryland, typically take trips to the northern landing area and into the designated PWC use area in Sinepuxent Bay. PWC use is not as prevalent on the southern end of the island in the designated PWC use area near Little Beach; however, some illegal use has been observed in Tom’s Cove.

## **Public Safety and Resource Concerns**

Prior to current management restrictions park staff observed close encounters between PWC and pedestrian water users (swimmers and surfers). These conflicts were most common on the ocean side in the waters south of the jetty. In addition, NPS rangers have been called to remove disabled watercraft from the beach along the north end of the seashore. PWC related accidents have been documented in the vicinity of the park, with two recorded fatalities in 2000.

Due to the variety of activities occurring within the park, conflicts between visitors do occur. According to a visitor survey conducted in 2000, approximately 96% of overall park visitors (out of 93 respondents) were satisfied with facilities, services, and recreational opportunities (NPS 2000a). In terms of recreational opportunities, approximately 97% of the visitors (out of 82 respondents) were satisfied with their experience. Recreational opportunities in this survey focused on learning about nature, history, or culture; outdoor recreation; and sightseeing. Sampling was not conducted at the two designated PWC landing areas on the island, so the survey may not be representative of visitors who were near PWC use areas. There is no available information on other watercraft operators and their views of personal watercraft. In addition, the survey may not be representative of visitors during other times of the year.

Resource concerns related to PWC use and potential effects exist. During the past three years wildlife management staff at the park have documented cases of PWC users harassing marine mammals through physical pursuit.

## **OBJECTIVES IN TAKING ACTION**

Objectives are what must be achieved to a large degree for an action to be considered a success. All alternatives selected for detailed analysis must meet all objectives to a large degree and must also resolve the purpose of and need for action.

Relevant statements from the national seashore's enabling legislation, the *Strategic Plan*, and other management documents are shown below in italics. These statements are followed by management objectives for personal watercraft, which are derived from the legislation and mandates and which are compatible with the purpose and significance statements of Assateague Island National Seashore presented above.

### **Water Resources**

*Assateague Island National Seashore provides a protected enclave for complex plant and animal communities, both terrestrial and aquatic, which characterize the Mid-Atlantic Coast.*

*Healthy salt marsh estuaries and ocean waters support a rich diversity of aquatic life.*

#### **Management Objectives:**

- Manage PWC operations to avoid impairment conditions, as defined by the Clean Water Act, in relation to hydrocarbon emissions.
- Protect aquatic organisms and sediments from PWC emissions so that the viability of species is conserved.



## **Air Quality**

*Provide high quality, resource-based recreational opportunities compatible with natural resource protection.*

### **Management Objective:**

- Manage PWC activity so that PWC air pollutant emissions of nitrogen-containing compounds do not measurably increase nutrient loading rates for the park's waters.

## **Soundscapes**

*Assateague Island is one of the few publicly accessible places along the congested U.S. east coast where one can experience unimpaired seashore values . . . natural sounds including quiet and solitude.*

*The island . . . serv[es] as a major stopover for migratory birds.*

### **Management Objectives:**

- Manage PWC use so that park natural soundscapes are affected by PWC noise only infrequently in a minority of park acreage, and so that PWC noise emissions are mostly confined to areas experiencing noise from other nonnatural sources.
- Protect birds including raptors, shorebirds, and waterfowl from the effects of PWC-generated noise, especially during nesting seasons and other critical life stages.

## **Wildlife and Wildlife Habitat, including Threatened and Endangered Species**

*Assateague Island is home, permanent and temporary, to a great biodiversity of life, including several threatened and endangered species, and a host of common plants and animals that depend on the island's fragile and special habitats.*

### **Management Objectives:**

- Protect fish and wildlife species, including those listed under the Endangered Species Act and under similar statutes, from PWC disturbances that result in injury, changes in distribution (both individuals and populations), and/or changes in population demographics.
- Protect fish and wildlife from the adverse effects that result from the bioaccumulation of contaminants emitted from personal watercraft.
- Manage PWC use to protect terrestrial plants including those listed under the Endangered Species Act and under similar state statutes.

## **Shoreline and Submerged Aquatic Vegetation**

*Assateague Island National Seashore provides a protected enclave for complex plant communities, both terrestrial and aquatic, which characterize the Mid-Atlantic Coast.*

### **Management Objective:**

- Manage PWC use to protect wetland and submerged aquatic vegetation (eel grass and widgeon grass).

### **Visitor Experience**

*Assateague Island is one of the few publicly accessible places along the congested U.S. east coast where one can experience unimpaired seashore values such as ocean water and beach, natural sounds including quiet and solitude, seashore viewsheds, and night skies.*

#### **Management Objectives:**

- Minimize the conflicts between PWC users and other park visitors.
- Cooperate with local and state entities that manage or regulate PWC use.

### **Visitor Safety**

*Provide high quality resource based recreational opportunities compatible with resource protection, and educate the public as to the values and significance of the area.*

#### **Management Objective:**

- Minimize PWC user accidents and safety conflicts between PWC users and other water recreationists.
- Provide park visitors with the opportunity to experience an unimpaired barrier island development.

### **SOCIOECONOMIC ENVIRONMENT**

- Minimize adverse impacts to local businesses that may be affected by PWC regulation

### **NATIONAL SEASHORE MANAGEMENT AND OPERATIONS**

- Minimize impacts to National Park Service operations from potential increased enforcement needs.
- Seek consistency between park and state and local management of PWC use when compatible with park purposes.

### **ISSUES RELATED TO PWC USE AT ASSATEAGUE ISLAND NATIONAL SEASHORE**

Issues associated with PWC use at Assateague Island National Seashore were identified during scoping meetings with NPS staff at the park and as a result of public comments. Many of these issues were identified in the settlement agreement with the Bluewater Network, which requires that at a minimum the effects of PWC use be analyzed for the following: water quality, air quality, soundscapes, wildlife and wildlife habitat, shoreline vegetation, visitor conflicts and visitor safety. Potential impacts to other resources were considered as well. The following impact topics are discussed in the “Affected Environment” chapter and are analyzed in the “Environmental Consequences” chapter. If no impacts are expected, based on available information, then the issue was eliminated from further discussion, as discussed beginning on page 18.

## **WATER QUALITY**

The main issues associated with PWC use and water resources at Assateague Island National Seashore are those related to water quality. Impacts to water quality result from emissions of hydrocarbons directly into the water. Discharges from PWC two-stroke engines have the potential to adversely affect water quality in Assateague Island National Seashore, especially in areas of poor circulation and low flushing, which include most of the national seashore's inshore waters. Areas that may be less susceptible to pollution effects include the areas of high tidal flow at either end of the island. Other water quality issues may include indirect effects on fish, marine mammals, and submerged aquatic vegetation, including threatened and endangered species, sensitive to water quality changes and degradation.

## **AIR QUALITY**

Pollutant emission, particularly nitrogen oxides and volatile organic compounds from personal watercraft, may adversely affect air quality. These compounds react with sunlight to form ozone.

## **SOUNDSCAPES**

### **Impact on Visitors from Noise Generated by PWC**

All motorized watercraft, including personal watercraft, produce noise that may impact park soundscapes and visitor experiences. Any watercraft that does not meet the NPS watercraft noise regulation of 82 dB at 82 feet at full acceleration is subject to fine and removal from the park. PWC-generated noise impacts is an issue for some visitors to Assateague Island National Seashore, particularly along the northern beaches, Sinepuxent Bay, and in the vicinity of Tom's Cove.

### **Impact on Waterfowl from Noise Generated by PWC**

Personal watercraft may have a greater impact on waterfowl and nesting birds than other types of watercraft because of their noise, speed, and ability to access shallow-water areas. This may force nesting birds, such as the threatened piping plover, at Assateague Island National Seashore to abandon eggs during crucial embryo development stages and flush other waterfowl from habitat, causing stress and associated behavior changes. Noise from personal watercraft and other boats, as well as the physical presence of the craft, might affect the distribution of birds such as shorebirds, raptors, and waterfowl.

### **Impact on Marine Mammals from Noise Generated by PWC**

Personal watercraft may have a greater impact on marine mammals, specifically dolphins that frequent the waters of the park, because of PWC noise, speed, and ability to access shallow-water areas. Although the full impact that noise has on marine mammals is not completely understood, the increase in man-made underwater noises could be a serious problem to their survival as it can interfere with their methods of communication and hunting strategy.

## **WILDLIFE AND WILDLIFE HABITAT**

### **Impact of PWC Use on Wildlife and Habitat**

Personal watercraft may impact wildlife, including marine mammals, prevalent at Assateague Island National Seashore by interrupting normal activities, causing alarm or flight, causing animals to avoid habitat, displacing habitat, and affecting reproductive success. Species most likely to be affected by PWC activities include numerous shorebirds, waterfowl and other birds including many migratory bird species that utilize Assateague Island. This is thought to be caused by a combination of PWC speed, noise, and ability to access sensitive areas, especially where there is shallow water.

### **Impact of PWC Use on Threatened and Endangered Species**

At Assateague Island National Seashore, PWC users may affect federally listed sea turtles and marine mammals that access Chincoteague and Sinepuxent Bays through the ocean inlets by colliding with and harassing them, resulting in harm to the animals and in decreased distribution.

While foraging for food, bald eagles and peregrine falcons may be affected by the physical presence and noise of PWC. Other threatened or endangered bird species that occur on the island, including the piping plover, might be affected by PWC noise and presence.

## **SHORELINE AND SUBMERGED AQUATIC VEGETATION**

### **Impacts to Shoreline Vegetation from PWC Use**

Shoreline and wetland vegetation, which is critical to numerous wildlife species (including fish and bird species) provides general overall habitat for a variety of other species occurring along the shorelines of Chincoteague and Sinepuxent Bays. PWC use can adversely affect shoreline and wetland vegetation as a result of direct impact, mechanical removal, and trampling.

### **Impacts to Submerged Aquatic Vegetation from PWC Use**

Submerged aquatic vegetation (SAV) is a diverse assembly of rooted macrophytes that grow in shallow water, under the surface, but not above it. These plants are beneficial to aquatic ecosystems because they provide a protective habitat for young and adult fish and shellfish, as well as food for waterfowl, fish, and mammals; and they aid in oxygen production, absorb wave energy and nutrients, and improve the clarity of the water. In addition, SAV beds stabilize bottom sediments and suspended sediments present in the water. PWC use has the potential to impact submerged aquatic vegetation because the craft can access shallow water environments. Direct impacts resulting from collision or mechanical removal can occur. PWC use may also affect the growth and health of submerged aquatic vegetation as a result of increased turbidity, decreased available sunlight, and deposition of suspended sediments on plants.

## **VISITOR EXPERIENCE**

Some research suggests that PWC use is viewed by some segments of the public as a nuisance due to the noise, speed, and overall environmental effects, while others believe that PWC use is no different from other watercraft, and recreationists have a “right” to enjoy the sport.

At Assateague Island National Seashore, families have complained that PWC use conflicts with swimming, surf fishing, and other activities. A major goal at Assateague Island National Seashore is to provide users with an isolated experience typical of a barrier island, and PWC use near the shoreline makes this difficult.

## **VISITOR SAFETY**

### **Impact to Visitor Safety from PWC Use**

In addition to PWC use, other national seashore activities include canoeing and kayaking in the bays and surfing on the oceanside at the north end of the park. These activities may be affected by the use of motorized watercraft, including personal watercraft.

### **Impact to Visitor Safety from Conflicting Uses**

Conflicts between PWC users and other boaters may exist at Assateague Island’s northern end. Several types of recreation boats and commercial fishing boats use the Ocean City Inlet to cross from the Atlantic Ocean to the Sinepuxent Bay. Many of the waterways are congested. Within Assateague Island National Seashore, boaters typically anchor off the northwest corner of the island in an area protected from the currents and traffic of the inlet. An estimated 75% of the recreational boating (typically fishermen) that occurs within the park boundary occurs within Sinepuxent Bay. Recent surveys of recreational boaters operating in the waters within and adjacent to Assateague Island National Seashore report a high frequency of conflicts between the public using traditional watercraft and PWC users. Problems reported include the presence of PWC users in fishing areas, noise, operation too close to anchored boats, and excessive speed. In addition, swimmers in several areas around the island have complained about personal safety issues related to the presence of PWC users.

## **SOCIOECONOMIC EFFECTS**

The two largest communities near Assateague Island National Seashore are Ocean City, Maryland, and Chincoteague, Virginia (see Location map). Both cities rely on tourism for their economic base. PWC use, especially PWC use within the national seashore, makes a relatively small contribution to tourist-related revenues in the regional economy. In addition, PWC users account for less than 0.5% of total visitation to the national seashore. NPS staff identified 15 PWC sales or rental shops in the vicinity of the national seashore. One PWC sales shop and 13 PWC rental shops were identified in Ocean City, Maryland. In addition, one PWC rental shop was identified in Chincoteague, Virginia. Interview data suggest that the rental shops near Assateague Island National Seashore have other sources of revenue aside from PWC rentals. These include parasailing, wildlife-viewing tours to the national seashore, boat ramps (with a fee), storage for the winter, a service center, and boating accessories.

In addition to businesses offering PWC sales and service, lodging establishments, restaurants, gas stations, and retail stores in the area could be affected by restrictions on PWC use.

## **NATIONAL SEASHORE MANAGEMENT AND OPERATIONS**

### **Impact to Park Operations from Increased Enforcement Needs**

Personal watercraft, because of their increased accident rates and visitor conflicts, require additional park staff to enforce standards, limits, or closures. The Maryland Department of Natural Resources, the U.S. Coast Guard, and the Coast Guard Auxiliary assist the National Park Service with enforcement needs at the north end of the island. NPS staff make every attempt to have a ranger, in a functional enforcement boat, located in the vicinity of the northern landing area seven days a week during the busy summer season (Memorial Day to Labor Day); however, they are often short-staffed.

### **Conflict with State and Local Ordinances and Policies Regarding PWC Use**

Some states and local governments have taken action, or are considering taking action, to limit, ban, and otherwise manage PWC use. Since the National Park Service has concurrent jurisdiction with Maryland and Virginia, the consistency of PWC-related management actions with those of state and local plans would have to be re-evaluated if the states took any future actions concerning PWC use. Maryland's *Comprehensive Conservation and Management Plan* identifies the goal of providing for nonmotorized, passive recreational boat uses on the coastal bays.

## **ISSUES ELIMINATED FROM FURTHER CONSIDERATION**

As explained below, the following impact topics and issues have been dismissed from further consideration:

*Cultural Resources:* No new cultural resource investigations were carried out as part of this study. The findings are based on the national seashore's existing cultural resource documentation (Bearss 1968; Knecht and Lazenby 1985), readily available historical sources on the island, and information provided orally by NPS employees. The known cultural resources on the island include the 1867 U.S. Coast Guard lighthouse (see Location map), which is listed on the National Register of Historic Places; the Assateague Beach Coast Guard Station on Tom's Cove Hook (see Location map), which is eligible for listing; and archeological sites associated with the 19th and early 20th century occupation of the island.

No systematic archeological survey has been made on the island; so additional, undiscovered sites may be present. For the most part, Native American peoples did not intensively occupy the narrow barrier islands of the Atlantic Coast. Additionally, the dynamic nature of these landforms tends to destroy evidence of human presence within centuries or even decades. Therefore, the potential for prehistoric archeological sites is generally low. The islands were regularly visited by Native Americans gathering shells, hunting birds, and collecting other marine resources, and shell middens left during these visits have been found on barrier islands. Generally these middens are on the bayside, near the inlets. It is assumed that these sites were once more common, but that most have been destroyed by the constant movement of the island sands. No middens have been noted on Assateague Island. Indian artifacts, including stone spear points or knives, stone ax heads, and a stone mortar, have been found by NPS personnel on the ocean beach; these presumably eroded from small campsites that once existed along the dunes facing the ocean.

Assateague Island was first settled by Europeans in colonial times, although little is known about this occupation. The island seems mainly to have been used for grazing animals; the island's famous pony herd is probably descended from animals introduced in the late 1600s. Until 1914 sheep were also kept on the island. It is possible that the remains of farms dating to the colonial period may be present, but none has been identified. The oldest standing building on the island is the lighthouse, which was completed in 1867, replacing an 1833 light at the same location. A lifesaving station was also built on the island in about 1875, on the Atlantic shore south of the lighthouse, and coast guard men based there participated in many rescues; the ruins of this station have been identified and investigated (Knecht and Lazenby 1985). Four other lifesaving stations were built on Assateague Island during the late 19th and early 20th centuries. Only the last one constructed, the Assateague Beach Coast Guard Station on Tom's Cove Hook remains intact.

A small settlement of fishermen and herders was present on the island in the 19th and early 20th centuries. The tourist trade to the island was described in national magazine articles of the 1870s, and tourism was no doubt already an important supplement to local incomes. The village was centered northeast of the lighthouse, and in 1900 the census listed 225 inhabitants. The village included a school from 1890 to 1919, and a Baptist church was present for a few years in the 1920s. Small factories, including a fertilizer/guano plant and a fish cannery, were established. The fish cannery was located on the strip of land between Tom's Cove and the ocean, and its ruins are readily visible. A cemetery was also present. After 1922 the town declined and its church and many of its houses were moved to Chincoteague. Foundations are still visible in the town area.

No known cultural resources have been identified within the vicinity of existing or potential future landing areas or PWC use areas in Assateague Island National Seashore and, therefore, this topic was eliminated from further consideration.

*Sacred Sites/Native American Concerns:* This is not an issue at Assateague Island because there are no known sacred sites or Native American concerns at Assateague Island National Seashore or, more specifically, within the vicinity of existing or potential future landing areas or PWC use areas.

*Environmental Justice:* On February 11, 1994, President Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." This order directs agencies to address environmental and human health conditions in minority and low-income communities so as to avoid the disproportionate placement of any adverse effects from federal policies and actions on these populations. Local residents may include low-income populations; however, these populations would not be particularly or disproportionately affected by PWC use. Other areas near the park, including Chincoteague Bay and the Ocean City bayside, are available to all PWC users. There are no minority PWC livery operators that would be affected by decreased or displaced PWC use. This issue is dismissed from further analysis for the following reasons:

1. Personal watercraft are used by a cross section of ethnic groups and income levels.
2. Other areas are available and open to personal watercraft and are used by all ethnic groups and income levels.
3. NPS actions would not disproportionately affect minority or low-income populations.

4. Any NPS actions to limit PWC use would not displace PWC use to low-income or ethnically sensitive areas.

*Wetlands* — Any potential impacts to wetlands in the vicinity of the shoreline are evaluated under the topic “Shorelines and Shoreline Vegetation.” (The extent of the area of impact is defined in the methodology section for shoreline vegetation.) Wetlands that occur farther inland within the preserve would not be affected by PWC use because of the limited distance that PWC users generally walk when not using their machines.

*Floodplains* — The level of PWC use and associated PWC activities identified in each alternative would have no adverse impacts on floodplains. No development is proposed in the alternatives; thus, no flooding would result as a result of PWC use and cause impacts to human safety, health or welfare.

*Prime and Unique Agricultural Lands* — No prime and unique agricultural farmland exists in the vicinity of areas that would be affected by PWC use.

*Energy Requirements and Natural or Depletable Resource Requirements* — PWC operation requires the use of fossil fuels. While PWC use could be limited or banned within Big Thicket National Preserve, no alternative considered in this environmental assessment would affect the number of personal watercraft used within the region or the amount of fuel that is consumed. The level of PWC use considered in this environmental assessment is minimal. Fuel is not now in short supply, and PWC use would not have an adverse effect on continued fuel availability .

## RELATIONSHIP TO OTHER PLANS, POLICIES, AND ACTIONS

A list of plans and policies, and other actions that may be relevant to PWC use or cumulative impacts analysis follows:

### NATIONAL PARK SERVICE PLANS, POLICIES, AND ACTIONS

#### 1982 General Management Plan

The Assateague Island *General Management Plan*, as drafted in 1982, includes brief natural, development, and historical management plans. It was created in coordination with the National Park Service, the Maryland Park Service, and the U.S. Fish and Wildlife Service to address the growing demands for recreational use, resource protection, and historic preservation within Assateague Island. The *General Management Plan* was developed in accordance with the National Environmental Policy Act of 1969, the Coastal Zone Management Act of 1972, and the National Historic Preservation Act of 1966. This document provides guidance for the park on the activities that may be established in each of the plan-designated developmental, natural, and historic zones within the national seashore. Although activities such as camping, hiking, horseback riding, hunting, bicycling, automobile use, and fishing are addressed, PWC and motorized watercraft use are not addressed in the *General Management Plan*.



### **1999 Resource Management Plan**

The *Resource Management Plan* establishes natural and cultural resource management objectives for Assateague Island National Seashore in compliance with the provisions of the *General Management Plan* and the national seashore's *Strategic Plan*. The plan does not address PWC or motorized watercraft use directly, but it does address the protection of resources that could be affected by PWC use.

### **2000 Strategic Plan, Fiscal Years 2001–2005**

The *Strategic Plan* addresses topics such as the mission of Assateague Island National Seashore, the goals for accomplishing and maintaining its mission, and strategies for achieving these goals from 2001 to 2005. A general overview of the park's organizational structure, financial resources, available facilities, and evaluation techniques is provided in this document.

Assateague Island's mission goals fall under one of the following five categories:

- Preserve park resources.
- Provide for public use, enjoyment, and visitor experience at the park.
- Strengthen and preserve natural and cultural resources.
- Enhance recreational opportunities.
- Ensure organizational effectiveness.

Within these five categories each specific long-term goal is highlighted in measurable ways. Although there are specific goals addressing recreational uses, educational opportunities, and resource improvement, no specific PWC and motorized watercraft use recommendations are proposed.

### **2000 Draft Long-Range Interpretive Plan**

The draft *Long-Range Interpretive Plan* details the national seashore's interpretive themes, which address the significant resources and identify the objectives for NPS services, programs, and media. Interpretive themes are used to help develop the story of the park by connecting its resources to the entire national park system and the mission of the National Park Service. Completion of this plan is on hold pending the appointment of a chief of interpretation. The plan does not address PWC and motorized watercraft use specifically, but it does outline the desired visitor experience at Assateague Island, including goals to create a relaxing environment, peace and quiet, and views free of human intrusion.

### **2000 Management and Monitoring of the Piping Plover**

This plan provides information on the existing piping plover population, plover nesting activities, and monitoring methods and results within the national seashore. Management activities for piping plover predators and the results of monitoring are also detailed. Additional topics discussed include goals for controlling visitor disturbance, threats associated with personal watercraft, the abundance of other ground-nesting species, other threatened and endangered species, and the occurrence of banded plovers.

## **2001 Air Resource Management Plan**

The *Air Resource Management Plan* highlights NPS goals and objectives regarding air quality, noise, artificial light, weather, and climate. This plan proposes an aggressive role for the National Park Service in preserving, protecting, and enhancing the air quality in all park units. The National Park Service aims to preserve the natural quiet and sounds associated with each park. To ensure protection from excessive noise, monitoring programs and necessary actions should be applied to prevent adverse effects to the natural resources and to the visitors at each park. While the plan addresses the need to protect the park's air quality and noise environment associated with all new and human sources, there are no specific regulations for personal or motorized watercraft.

## **OTHER FEDERAL AGENCY PLANS, POLICIES, AND ACTIONS**

### **1972 Coastal Zone Management Act**

In recognition of the increasing pressures of over-development upon the nation's coastal resources, Congress enacted the Coastal Zone Management Act in 1972. The act encourages states to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. A unique feature of the coastal zone management program is that participation by states is voluntary. To encourage states to participate, the act makes federal financial assistance available to any coastal state or territory that is willing to develop and implement a comprehensive coastal management program.

State coastal zones include the coastal waters and adjacent shorelands that extend inland to the extent necessary to control activities that have a direct, significant impact on coastal waters. For federal approval, a coastal zone management plan must (1) identify the coastal zone boundaries; (2) define the permissible land and water uses within the coastal zone that have a direct and significant impact on the coastal zone and identify the state's legal authority to manage these uses; (3) inventory and designate areas of particular concern; (4) provide a planning process for energy facilities siting; (5) establish a planning process to assess the effects of, and decrease the impacts from, shoreline erosion; and (6) facilitate effective coordination and consultation between regional, state, and local agencies. The National Oceanic and Atmospheric Administration approve coastal zone management plan and oversees subsequent implementation of the programs.

### **1993 Chincoteague National Wildlife Refuge Master Plan**

The *Chincoteague National Wildlife Refuge Maser Plan* provides objectives and goals for long-range natural resources, wildlife and habitat, public use, archeological resources, and recreation management, as established by the U.S. Fish and Wildlife Service for the refuge. Chincoteague National Wildlife Refuge will be administered for purposes of public outdoor recreation in coordination with all U.S. Fish and Wildlife Service regulations. PWC and motorized watercraft use and management are not specifically addressed in this master plan.

## STATE AND LOCAL GOVERNMENT PLANS, POLICIES, AND ACTIONS

### 1997 Comprehensive Plan for Ocean City, Maryland

*The Comprehensive Plan for Ocean City, Maryland*, provides information on population, economy, land use, transportation, community facilities, housing, sensitive areas and the environment, downtown revitalization, and plan implementation. Waterways and boat traffic conflicts such as the need for channel markers, public marina facilities, public launching facilities, and insufficient dredging are addressed. This plan does not mention the recreational uses, conflicts, or impacts associated with PWC and motorized watercraft use in the area.

### 1998 Maryland Clean Water Action Plan

Maryland's *Clean Water Action Plan* provides information on the state's watershed restoration priorities and action strategies. Based on the state's unified watershed assessment, the state established restoration priorities for those watersheds that did not meet clean water or natural resource goals. The long-term restoration action strategies include performing watershed assessments on sources that adversely impact the system, creating a public involvement process, implementing remedial activities, and developing monitoring plans. PWC and motorized watercraft use are not specifically addressed in the plan.

### 1999 Comprehensive Conservation and Management Plan for Maryland's Coastal Bays

This *Comprehensive Conservation and Management Plan* addresses the long-term restoration and protection for water quality, fish and wildlife, recreation and navigation, and community and economic development in Maryland's coastal bays. It addresses the balance between resource protection and recreational uses, including PWC and motorized watercraft use and user safety issues. Concerns are expressed about the threats that personal watercraft create in sensitive areas due to pollution and increased noise. The overall plan is to identify the various sensitive resources and the recreational activities that may affect those resources and then to develop protection methods and educational programs. Actions such as designating zones for specific recreational use, developing more upland recreational opportunities to reduce pressure on the water opportunities, and instituting time-of-year use restrictions were outlined as protection strategies.

In addition to natural resource concerns, boating safety issues are also addressed for specific areas (such as the U.S. Route 50 Bridge in Ocean City). Concerns about conflicting uses between the non-boating public, other recreational users, fishermen, and PWC and motorized watercraft users are detailed, along with the concern for public awareness about boating rules and regulations in the coastal bays. Strategies for addressing these problems include conducting opinion surveys, developing alternative routes for boat and PWC travel, creating specific areas for fishing, requiring boater education courses, and coordinating with insurance companies for improved safety inspections.

### 2000 Worcester County (MD) Land Preservation and Recreation Plan

The Worcester County *Land Preservation and Recreation Plan* is a strategy for enhancing parks and recreational services and for preserving open space and natural resources in Worcester County. This plan does not mention recreational uses, conflicts, or impacts associated with PWC and motorized watercraft use in the area.

### **2001 Boat Operating Procedures in Maryland**

Maryland boat operating procedures are described for passing, navigational markers, and nautical chart resources. The actions highlighted are to be taken by all vessels to avoid accidents and collisions. The guidelines describe specific regulations and safe use policies for personal watercraft, as described below for Maryland boating laws.

### **2002 Water Use Management Plan for Coastal Bays in Maryland**

The document is scheduled to be completed in 2002 by the Maryland Department of Natural Resources Workgroup. The purpose of the effort is to develop a management plan specific to the water surface, water column, and submerged lands in order to focus the department's activities and responsibilities in the coastal bays. The plan must be consistent with the *Comprehensive Conservation Management Plan* so as to maximize recreational and economic benefits derived from the use of coastal bays while maintaining and enhancing the sustainability of natural resources. This planning effort will consist of analyzing aerial photographs to identify scarred areas and reviewing aerial boat survey data and field data to evaluate the impact that different boating activities may have had on submerged aquatic vegetation.

### **1998 Virginia Unified Watershed Assessment and Restoration Priorities**

Virginia's *Unified Watershed Assessment and Restoration Priorities* were developed in response to the federal Clean Water Action Plan. Like Maryland's *Clean Water Action Plan*, it classifies watersheds into categories based on environmental conditions and restoration needs. Impaired stream segments, nonpoint source loading, and nutrient monitoring data are evaluated when classifying each watershed. Like the Maryland unified watershed assessment, the Virginia assessment does not specifically address PWC concerns or issues when making recommendations for each watershed.

### **2001 Draft Virginia Outdoors Plan**

The *Virginia Outdoors Plan* addresses Virginia's open space, natural, and recreational resources. The draft plan is based on guidance and direction from the 1996 *Virginia Outdoors Plan*. The plan provides a regional analysis and recommendations for what is designated as the Accomack-Norfolk Planning District. Recommendations in the plan related to Assateague Island include completing studies of Assateague Island National Seashore to determine where appropriate support facilities could be located while preserving the integrity of the bays. The plan also recommends the development of a transit system to provide access to the island's recreational resources. While the plan does not provide specific recommendations related to PWC or motorized watercraft use, the 2000 *Virginia Outdoor Survey* ranked water-related activities in the top 10 activities preferred by Virginians.

### **Coastal Zone Management Act**

The 1972 Coastal Zone Management Act (CZMA) seeks to preserve, protect, develop and, where possible, restore and enhance the resources of the nation's coastal zone. Maryland's Coastal Zone Management Program, approved in 1978, is designed to protect coastal and marine resources by achieving a balance between development and protection in the coastal zone. The program addresses a

variety of coastal issues, including public access, nonpoint source pollution, coastal hazards, habitat and living resources protection and growth management. The Department of Natural Resources is the lead agency for this program. In Maryland the chief of coastal zone management for the Department of the Environment is responsible for determining consistency of proposed activities in the coastal zone with the provisions of the program.

Activities conducted within the coastal zone are required to be consistent with provisions established in Maryland's coastal zone management program. Section 307 of the federal Coastal Zone Management Act, as amended, requires that proposed federal activities affecting a state's coastal zone be consistent, to the maximum extent practicable, with the state's federally approved program.

Maryland focuses its consistency review on activities in compliance with the state's Tidal Wetlands Law and the Chesapeake Bay Critical Areas Act. Federal agencies are exempt from the state's tidal wetlands permitting process, but proposed activities are reviewed by agencies for consistency with the coastal zone management program and other regulatory programs based in part on the avoidance and minimization of impacts to tidal wetlands. Consistency review by the Maryland Department of the Environment emphasizes the avoidance and minimization of impacts to tidal wetlands and submerged aquatic vegetation as part of their evaluation for CZMA consistency.

In Virginia activities conducted within the coastal zone are also required to be consistent with the state's coastal zone management program. Consistency is based on compliance with provisions and permit requirements established by eight enforceable programs for fisheries management, subaqueous lands management, wetlands management, dunes management, nonpoint source pollution control, point source pollution control, shoreline sanitation, and air pollution control. Consistency is based on obtaining all applicable permits required by the enforceable programs.

### **Boating Laws**

The Maryland boating laws maintain specific requirements for PWC users on all waters within state boundaries. These laws establish requirements and standards for user age, operating hours, the type of gear that must be worn on board, potential PWC uses, use in proximity to other watercraft and swimmers, and registration needs. Speed limits and safety operating rules are also recommended.

The Virginia Boating Laws require that PWC users follow all boating laws, but can only operate during specific times (daylight hours). There are also age restrictions, boating education course requirements, life saving device rules, and speed and wake limitations when passing swimmers and other boaters.



# ALTERNATIVES

Alternatives selected for full analysis in this environmental assessment must meet the objectives of the park to a large degree, while also meeting the purpose of and need for action. Four alternatives are described in this section, along with other alternatives that were considered and eliminated from further consideration. The alternatives analyzed in this document in accordance with the National Environmental Policy Act are the result of agency and public scoping input, and as stipulated in the settlement agreement between the Bluewater Network and the National Park Service. The action alternatives address continued PWC use under a special regulation for new management strategies and mitigation measures. The no-action alternative assumes the National Park Service would not take action to promulgate a special regulation to keep national seashore waters open to PWC use; hence PWC use would not be permitted within any areas of the national seashore.

## **ALTERNATIVE A — CONTINUE PWC USE AS CURRENTLY MANAGED UNDER A SPECIAL REGULATION**

Under alternative A, a special regulation would be adopted to continue the current management and regulation of PWC use, as provided for in the Park Superintendent's Compendium. This is considered the "baseline" alternative to compare against other management strategies including closure of the unit to PWC use. The Park Superintendent's Compendium prohibits PWC use within the boundary of Assateague Island National Seashore except in the following areas (see Alternative A North End and South End maps):

1. *Ocean City Inlet* — PWC users may operate, transit, launch, or beach south of the established Ocean City Inlet channel markers from Ocean City lighted buoy 10 west to Ocean City lighted buoy 11. PWC users may not operate, transit, launch, or beach between the Ocean City inlet channel and the Ocean City inlet south jetty within the established park boundary to ½ mile offshore.
2. *Sinepuxent Bay* — Generally, the seashore boundary in Sinepuxent Bay is the PWC closure boundary. Use is not allowed in the bay between the boundary and the island shore except for a small area between the submerged aquatic vegetation (SAV) buoys and the seashore boundary (see Alternative A North End map). In the Park Superintendent's Compendium, the National Park Service chose to use the established SAV buoys (east of the seashore boundary) to demarcate the PWC closure area, rather than the seashore boundary: (a) PWC users may not operate, transit, launch, or beach east of the channel markers from Ocean City Inlet lighted buoy 11, south to Sinepuxent Bay channel day beacon 10; (b) PWC may not operate, transit, launch, or beach east of the established seashore boundary from Sinepuxent Bay channel day beacon 10, south to a point of intersection between the established seashore boundary and the line of SAV closure buoys running southeast from Sinepuxent Bay channel light 13; and (c) PWC users may not operate, transit, launch, or beach east of the established SAV closure buoys from the aforementioned point of intersection, south to Verrazano Bridge.
3. *Chincoteague Bay* — PWC users may not operate, transit, launch, or beach east of the established seashore boundary from the Verrazano Bridge south to the Chincoteague Inlet, except as provided for below. PWC users may operate, transit, or launch on the beach east of the established park boundary from Assateague Point north to that portion of Horse Marsh opposite the Memorial Park boat ramp. PWC users are only allowed access to that portion of Chincoteague National Wildlife Refuge designated as Little Beach.

4. *Oceanside* — PWC users may not operate, transit, or launch west of the established seashore boundary from the Ocean City Inlet jetty south to the Chincoteague Inlet. PWC users must remain outside the park boundary, which is ½ mile offshore, at all times. PWC users are permitted to beach along the ocean side of the island only in emergency situations (injury, mechanical failure, etc).

The PWC landing areas would remain in place to ensure that visitors who use personal watercraft as a mode of transportation would continue to have access to the island. All of the restrictions contained in the Park Superintendent's Compendium would be in the special regulation and would remain in effect for both the short and long term. The seashore's waters would be closed to PWC use except in the Ocean City Inlet on the island's north end, in the vicinity of Little Beach on the island's south end, and in the area between the SAV markers and the seashore boundary in Sinepuxent Bay as described above (see Alternative A North End and South End maps).

#### **ALTERNATIVE B — CONTINUE PWC USE UNDER A SPECIAL REGULATION, BUT LIMIT AREA OF USE (PREFERRED ALTERNATIVE)**

Alternative B would be the same as alternative A, except an additional geographic restriction on PWC use would be implemented (see Alternative B North End and Alternative B South End maps). The open area in the Sinepuxent Bay between the SAV buoy line and the seashore boundary would be closed to PWC use. The park would install new markers to delineate the boundary of the national seashore separate from the existing SAV boundary. PWC users would be required to stay west of the seashore boundary; no PWC use would be allowed between the island shore and the seashore boundary through Sinepuxent Bay. This action would enforce closure of the national seashore to all PWC use except at the two permitted landing areas in the Ocean City Inlet and at Little Beach in Chincoteague Bay.

#### **ALTERNATIVE C — CONTINUE PWC USE UNDER A SPECIAL REGULATION, BUT LIMIT AREA OF USE AND IMPLEMENT OTHER MANAGEMENT RESTRICTIONS**

Alternative C would eliminate PWC use within the seashore boundaries, including Sinepuxent Bay, except for the two landing areas at the Ocean City Inlet and Little Beach, as described for alternative B (see Alternative C North End and Alternative C South End maps). However, under alternative C, personal watercraft would have to comply with no-wake zones when accessing landing points within the seashore boundary. The intent of this alternative would be to enforce or further reinforce the national seashore's goal to allow a PWC transportation corridor to and from Assateague Island, rather than allowing PWC use as a recreational pursuit within the seashore boundaries; therefore, no PWC use would be allowed except to access the two landing areas. The no-wake zones would apply to the access corridors within the park boundary.

#### **NO-ACTION ALTERNATIVE**

For the purposes of this analysis, the no-action alternative assumes a scenario of discontinuing all PWC use at this national park system unit. At the end of the grace period, the National Park Service would take no further action to adopt special regulations retaining PWC use, which would result in a ban on PWC use at the seashore beginning in April 2002 (see No-Action Alternative North End and No-Action Alternative South End maps).

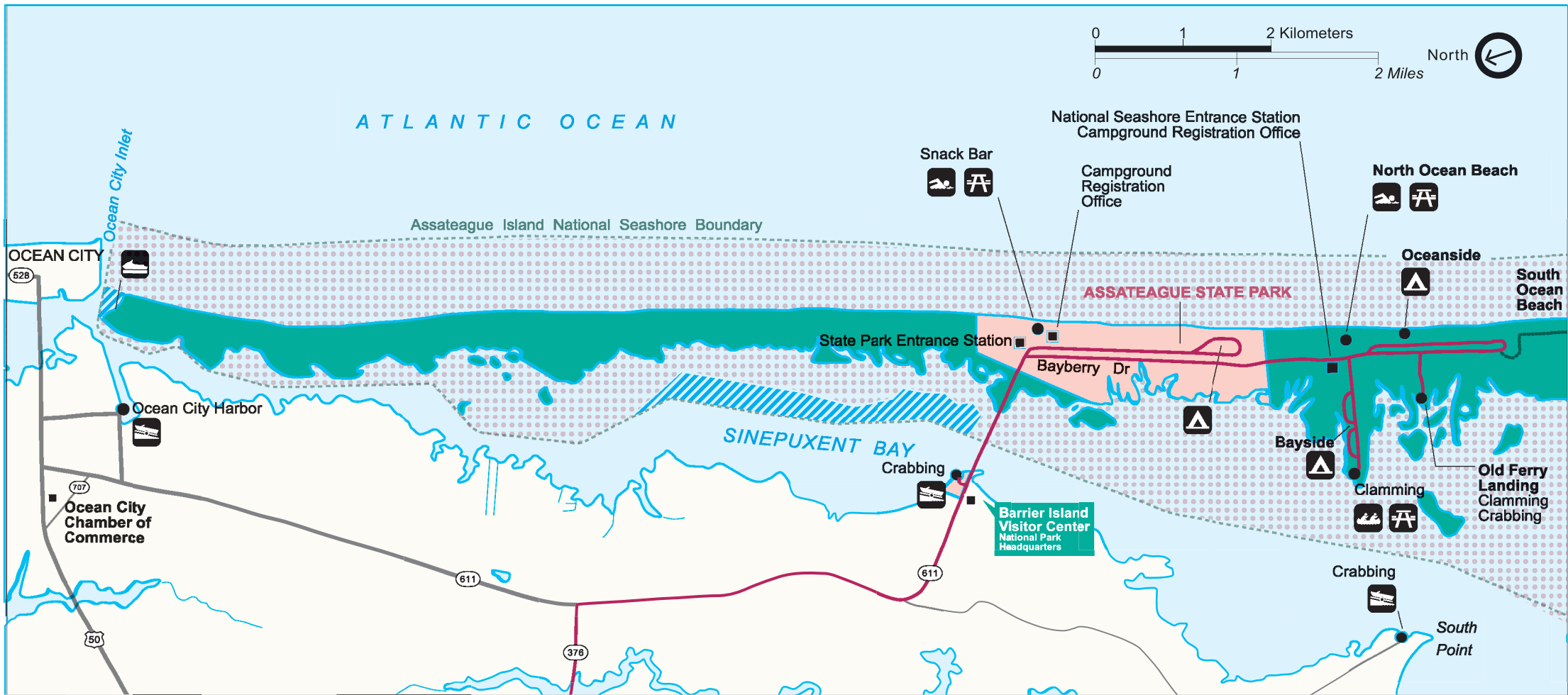


# Assateague Island National Seashore

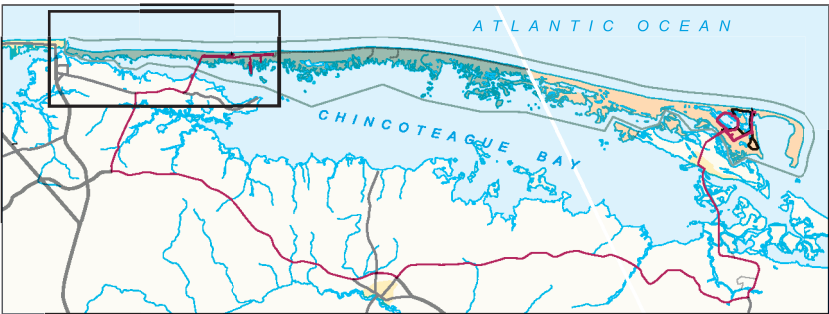
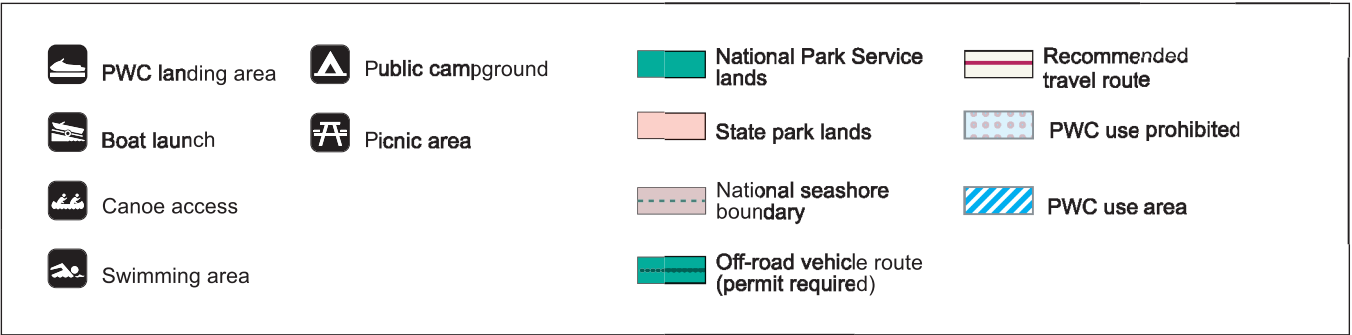
Maryland / Virginia

Alternative A: North End  
 -- Continue PWC Use as Currently Managed under a Special Regulation

The seashore's waters would be closed to PWC use, except in the Ocean City Inlet on the island's north end and in the area between the SAV buoys and the seashore boundary.



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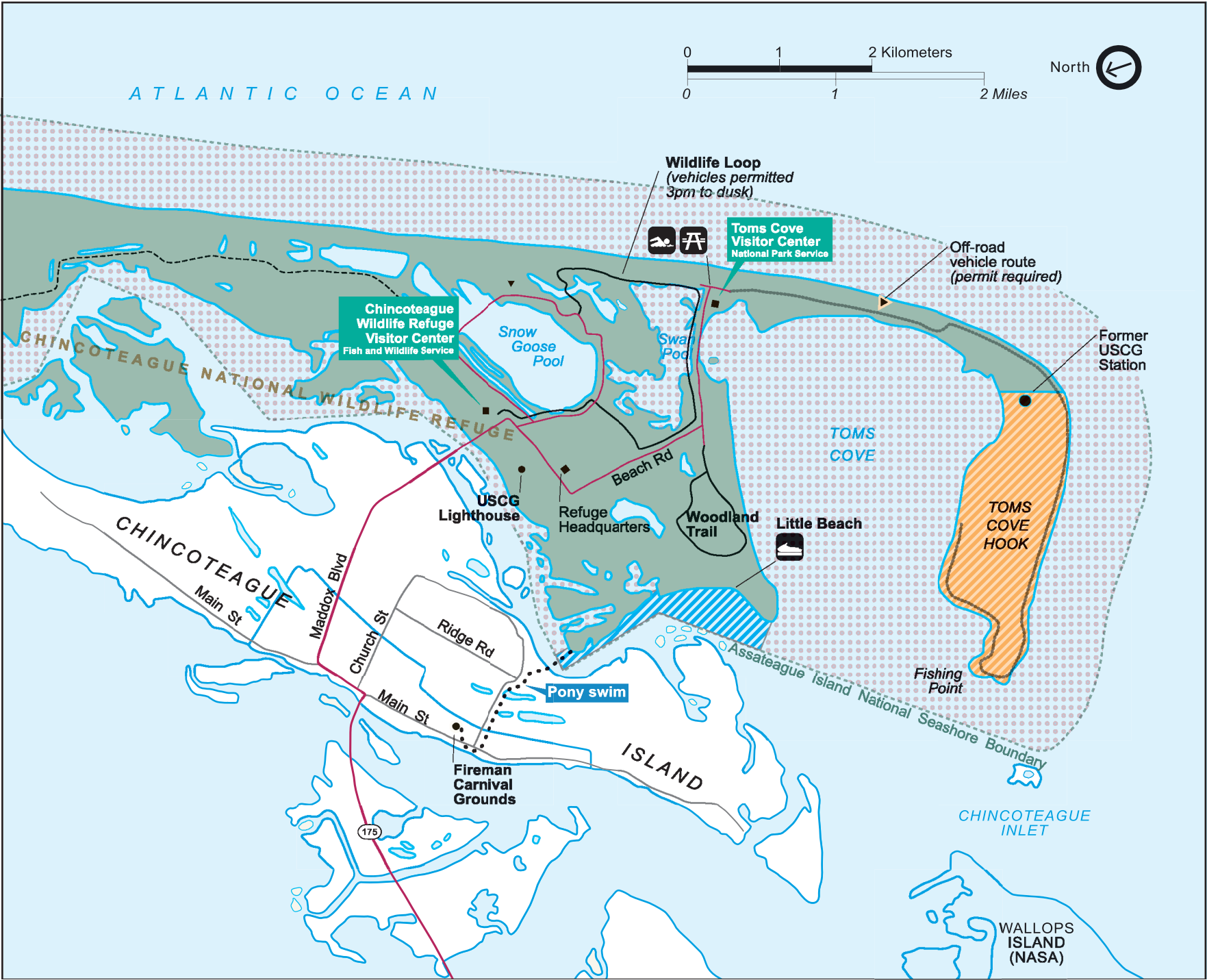


# Assateague Island National Seashore

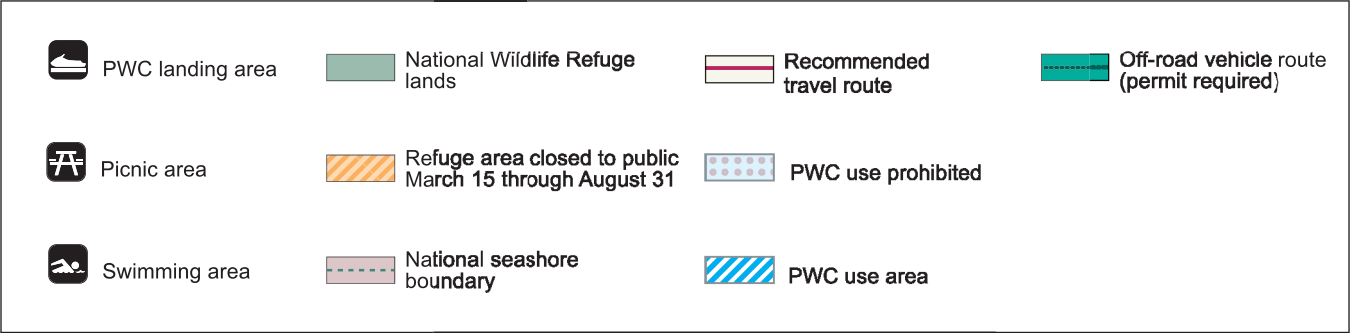
Maryland / Virginia

Alternative A: South End  
 -- Continue PWC Use as  
 Currently Managed under  
 a Special Regulation

The seashore's waters would be  
 closed to PWC use, except in the  
 vicinity of Little Beach on the  
 island's south end.



United States Department of the Interior / National Park Service WASO/April '02/622-20025



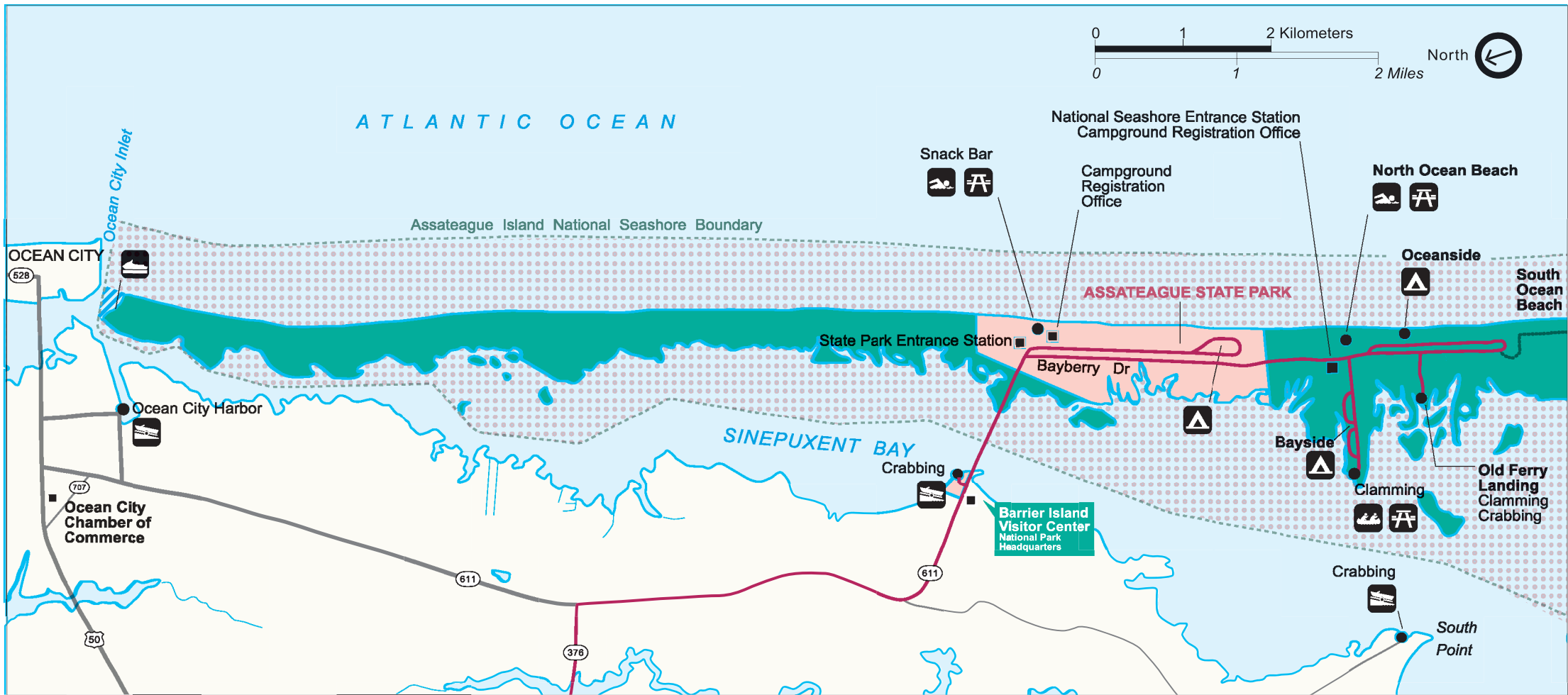


# Assateague Island National Seashore

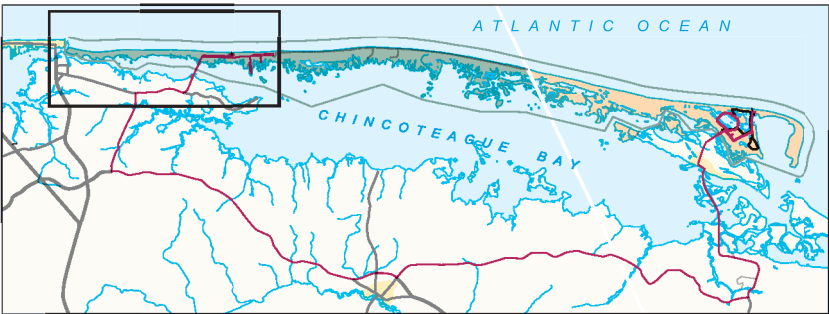
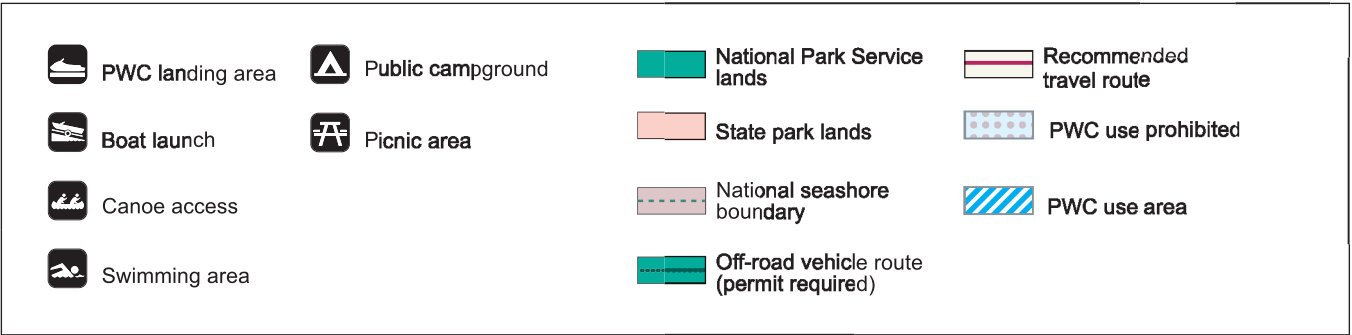
Maryland / Virginia

Alternative B: North End  
-- Continue PWC Use, but  
Limit Area of Use under  
a Special Regulation

Same as alternative A, except  
the open area in the Sinepuxent  
Bay between the SAV buoy line  
and the seashore boundary  
would be closed to PWC use.



United States Department of the Interior / National Park Service WASO/April '02/622-20026





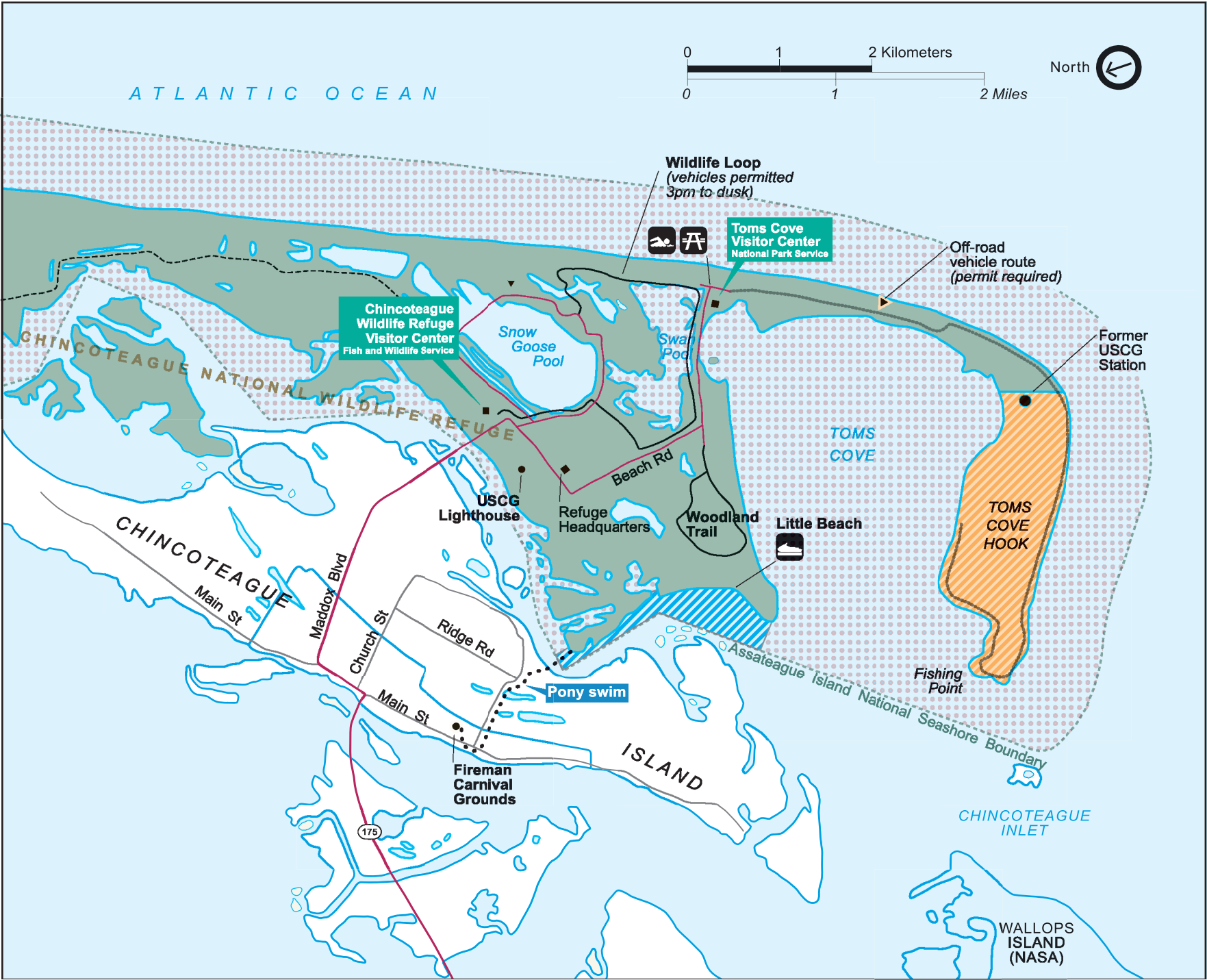


# Assateague Island National Seashore

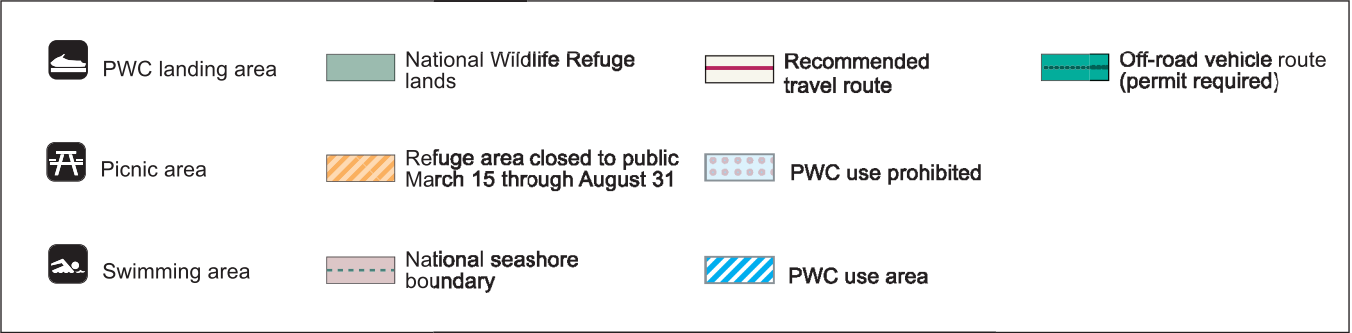
Maryland / Virginia

Alternative B: South End  
-- Continue PWC Use, but  
Limit Area of Use under  
a Special Regulation

Same as alternative A.



United States Department of the Interior / National Park Service WASO/April '02/622-20027





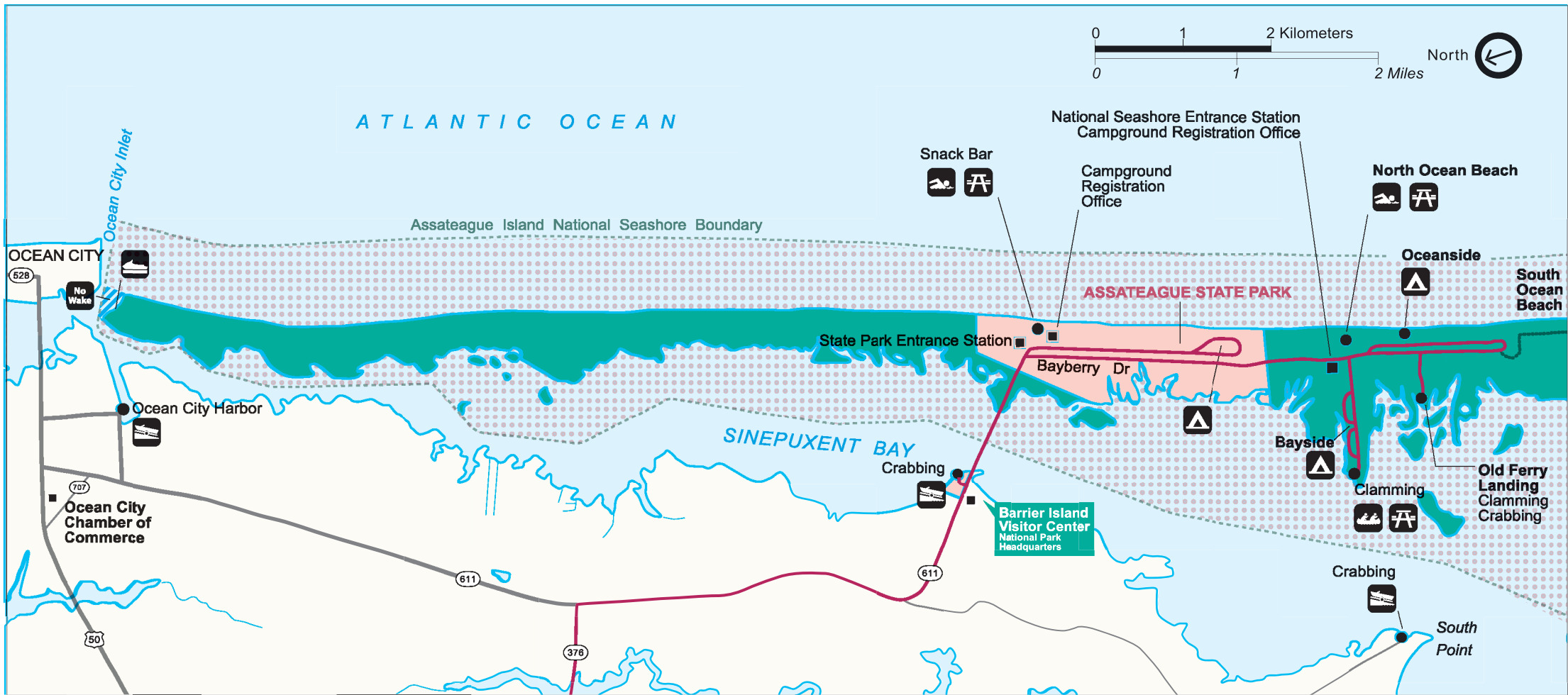


# Assateague Island National Seashore

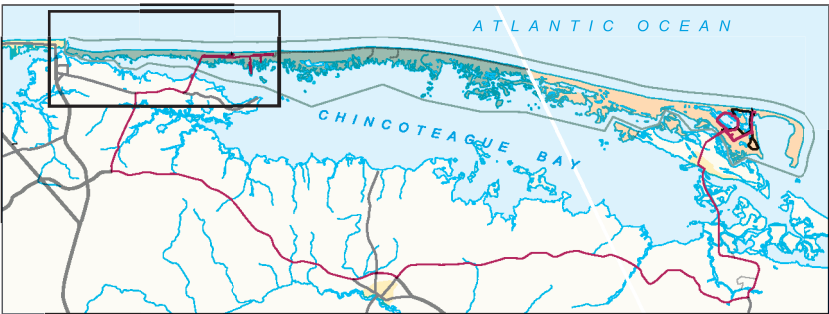
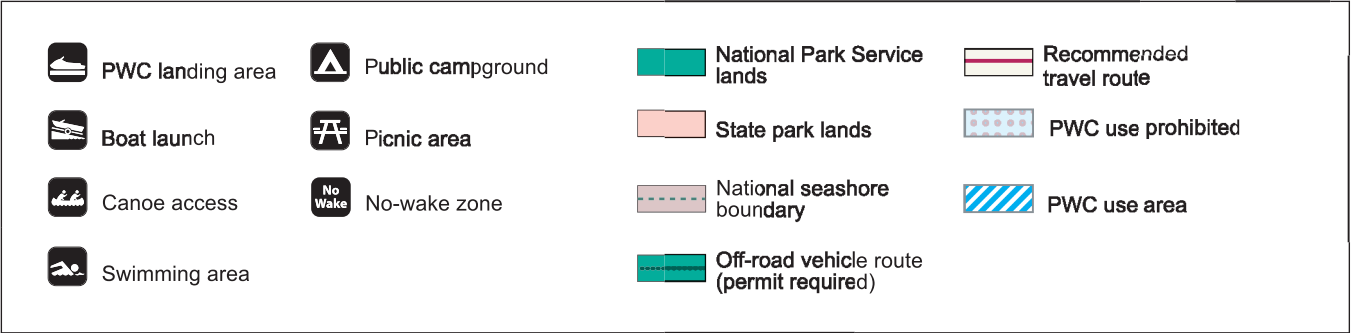
Maryland / Virginia

Alternative C: North End  
-- Continue PWC Use, but  
Limit Area of Use under  
a Special Regulation and  
Implement Other  
Management Restrictions

Eliminate PWC use within the seashore boundary, including Sinepuxent Bay, except for the two landing zones at the Ocean City Inlet. PWC would have to comply with no-wake areas when accessing landing points within the seashore boundary.



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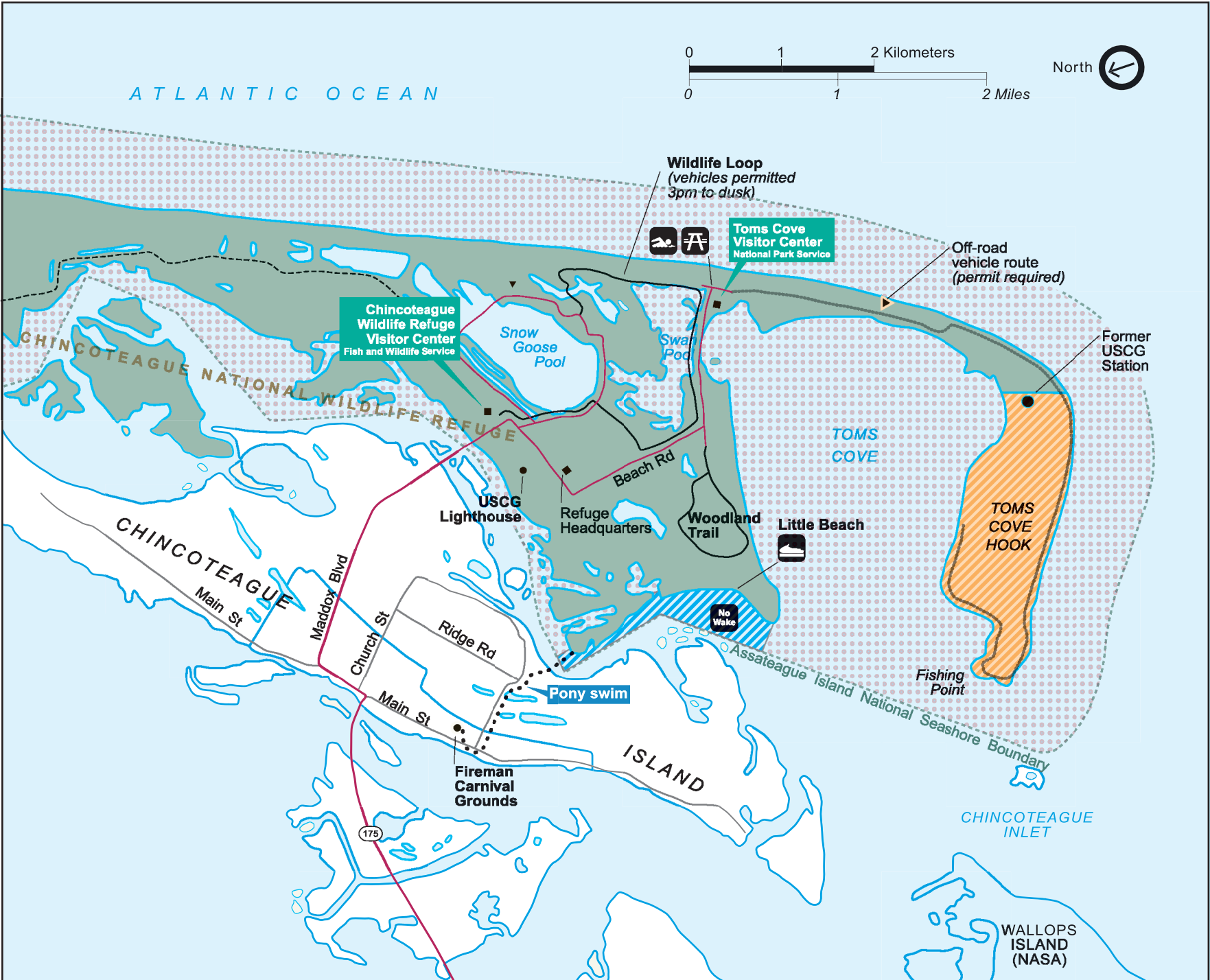


# Assateague Island National Seashore

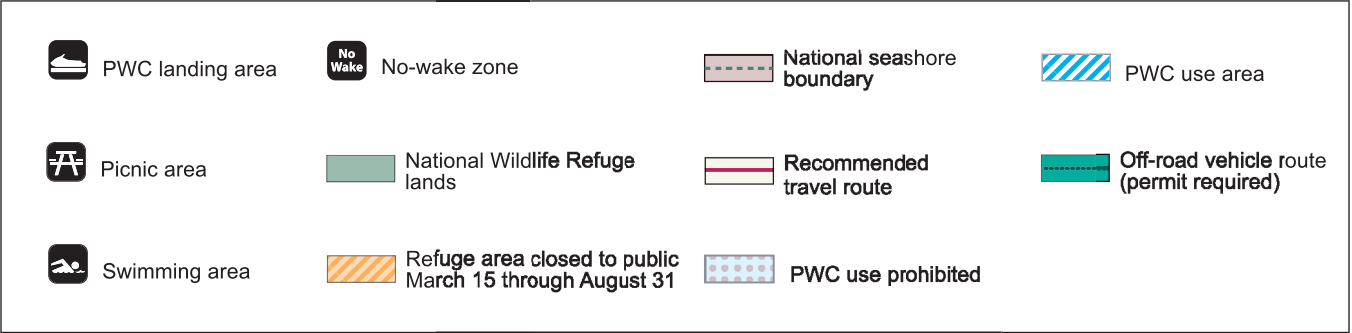
Maryland / Virginia

Alternative C: South End  
 -- Continue PWC Use, but Limit Area of Use under a Special Regulation and Implement Other Management Restrictions

Eliminate PWC use, except for Little Beach. PWC would have to comply with no-wake areas when accessing landing points within the seashore boundary.



United States Department of the Interior / National Park Service WASO/April '02/622-20029



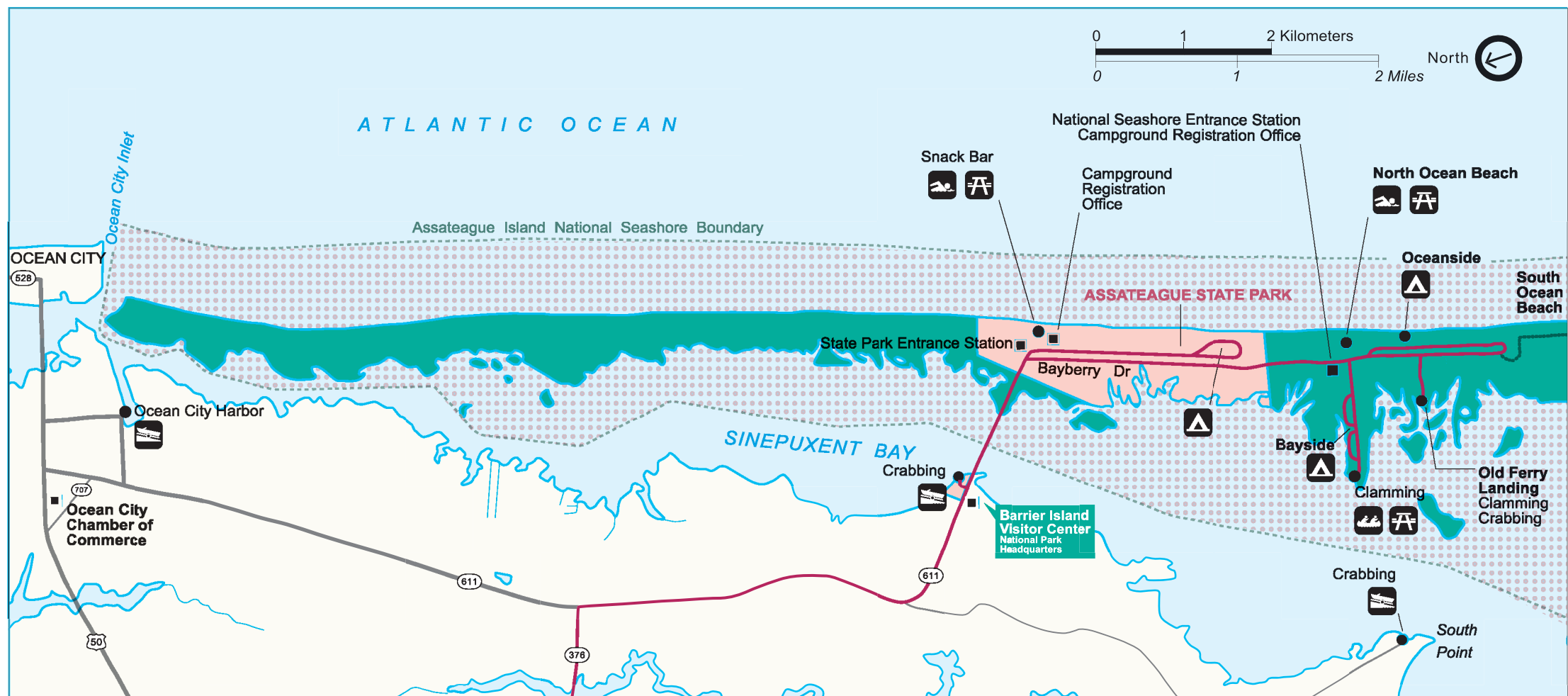


# Assateague Island National Seashore

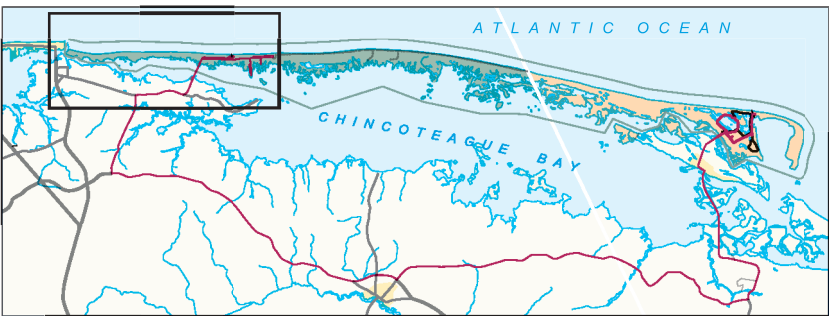
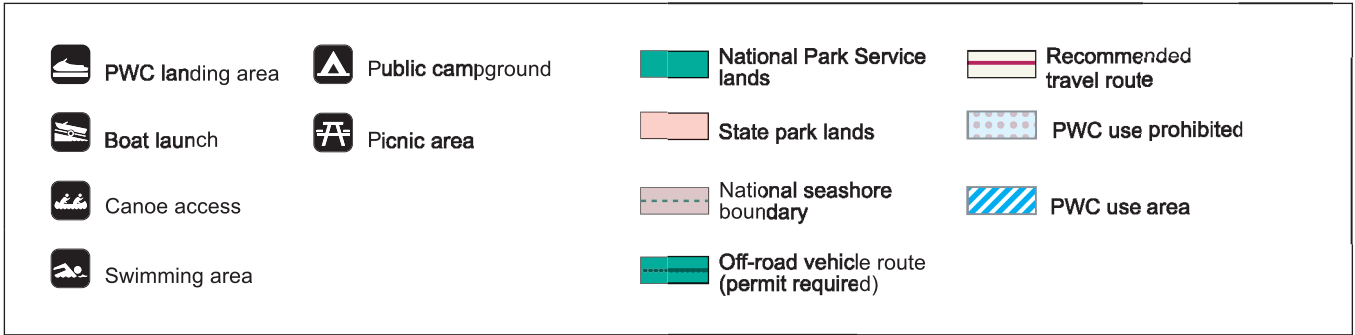
Maryland / Virginia

## No Action Alternative: North End

Continue present management actions, including the geographical restrictions in the "Superintendent's Compendium." The National Park Service would take no further action to adopt special regulations retaining PWC use, which would result in a ban on PWC use at the seashore beginning in April 2002.



United States Department of the Interior / National Park Service WASO/April '02/622-20020





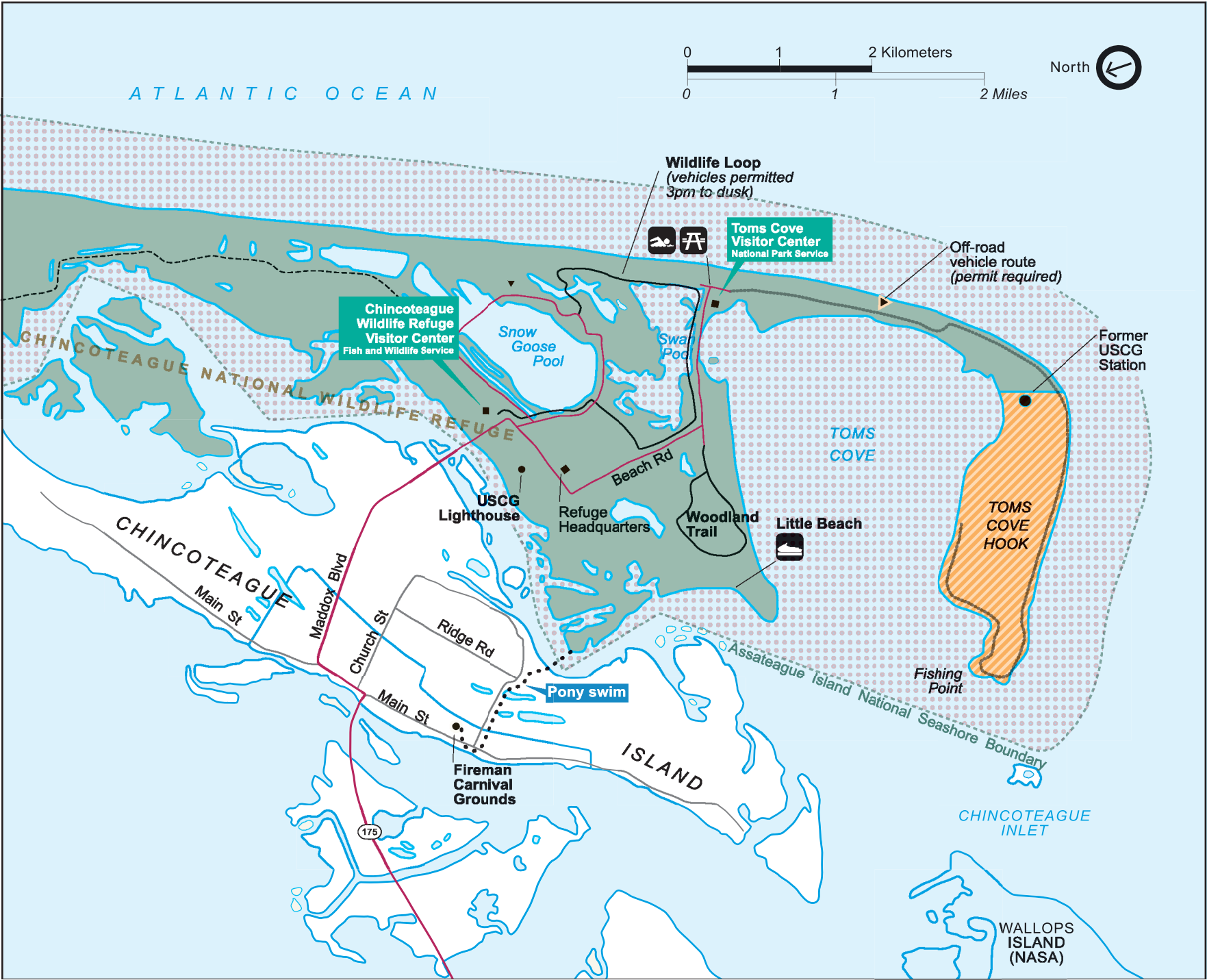


# Assateague Island National Seashore

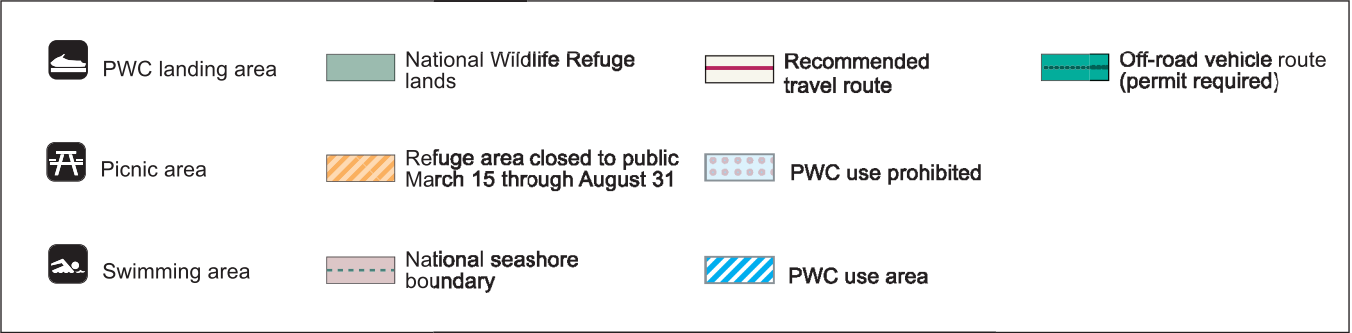
Maryland / Virginia

## No Action Alternative: South End

Continue present management actions, including the geographical restrictions in the "Superintendent's Compendium." At the end of the grace period, the National Park Service would take no further action to adopt special regulations retaining PWC use, which would result in a ban on PWC use at the seashore beginning in April 2002.



United States Department of the Interior / National Park Service WASO/April '02/622-20021







## **ENVIRONMENTALLY PREFERRED ALTERNATIVE**

The environmentally preferred alternative is the alternative that will promote the National Environmental Policy Act, as expressed in section 101 of the act. The identification of the environmentally preferred alternative is that which best meets the following requirements:

Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.

Ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.

Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.

Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.

Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.

Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The environmentally preferred alternative is the alternative that causes the least damage to the biological and physical environment — the alternative that best protects, preserves, and enhances historic, cultural, and natural resources. This discussion also summarizes the extent to which each alternative meets section 102(1) of the National Environmental Policy Act, which asks that agencies administer their own plans, regulations, and laws so that they are consistent with the policies outlined above to the fullest extent possible.

Alternative A would satisfy the majority of the six requirements detailed above; however, alternative A would not ensure safe, healthful, productive, and aesthetically pleasing surroundings by allowing PWC use in areas frequented by passive outdoor recreationists, specifically, continued PWC use in Sinepuxent Bay. Alternative A would not attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences because of the potential impacts of PWC use to visitor experience, wildlife, and other recreational opportunities in the park such as fishing, canoeing, and kayaking. For this reason, alternative A is not preferred from an environmental perspective.

Alternatives B would have impacts on park resources and visitor use and experience at Assateague Island National Seashore very similar to those described for alternative A; however, it would further restrict PWC use within Sinepuxent Bay. Alternative B would provide for increased safety of water recreationists within the park boundary and allow for a wider range of recreational uses. Because of the level of activity, the potential for accidents with boaters in the Ocean City Inlet is considered moderate. The nature of PWC use poses threats to the safety of PWC operators and to vessels with slower reaction times. However the areas proposed to be open to PWC use, generally defined as transportation corridors, over time and with sufficient enforcement of state boating law, would come to serve as access lanes to legal landing areas and therefore serve to mitigate potential hazards. In the long term this alternative would help visitors enjoy a beneficial use of the park, allowing for access to the park amenities by PWC users while accommodating passive outdoor recreationists enjoying the quiet soundscapes of the park. This alternative would emphasize recreational opportunities for visitors while protecting sensitive natural and cultural resources. The proposed alternative is designed to meet the National Park Service general prohibition on PWC for the protection of park resources and values

while providing access to the island by PWC operators utilizing their craft in a transportation role for that purpose.

Alternative C, like alternative B, would improve the safety of water recreationists within the park boundary and would allow for a wider range of recreational uses. In the long term it would help visitors enjoy a beneficial use of the park, allowing for access to the park amenities by PWC users while accommodating passive outdoor recreations enjoying the quiet soundscapes of the park. This alternative would emphasize the recreational opportunities for visitors while protecting sensitive natural and cultural resources. The addition of no-wake zones in those areas where PWC operation could continue would add additional environmental and safety protection compared to alternative B. Since alternative B would emphasize PWC access to the park as a means of transportation, the addition of no wake zones in alternative C would not substantially enhance visitor safety or experience over that provided for in alternative B.

The no-action alternative would ensure a safe, healthful, productive, and aesthetically and culturally pleasing surroundings for visitors to access without the threat of PWC users entering the area and introducing noise and safety considerations. The no-action alternative would attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences of removing PWC use from the park entirely. However, the no-action alternative would not maintain an environment that supports diversity and variety of individual choice, nor would it achieve a balance between population and resource use that permits a wide sharing of amenities.

Based on the environmental analysis prepared for PWC use at Assateague Island National Seashore, alternative B is considered the environmentally preferred alternative, best fulfilling park responsibilities as trustee of this sensitive habitat; ensuring safe, healthful, productive, and aesthetically and culturally pleasing surroundings; and attaining a wider range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.

## **ALTERNATIVES CONSIDERED BUT NOT ANALYZED FURTHER**

Expanding PWC use at Assateague Island National Seashore was eliminated because of the serious concerns that led to the restrictions in the first place (PWC user safety, park user safety/use conflicts, harassment of marine mammals, and disturbance of birds and other wildlife). In addition, it is difficult to provide additional landing areas in the bay because of submerged aquatic vegetation along the island shores and because of potential visitor use conflicts (canoeing, kayaking, etc). Sandy Beach was one possible site on the bayside with reasonable access to the ocean; however, resource and visitor use conflicts would result in too many impacts. Specific concerns with each of these bayside or oceanside landing areas alternatives include:

- Fish and wildlife (plovers, marine mammals) in estuaries, in the inlet, and in island nesting areas could not be protected.
- There would be potential impacts to dune grasses from PWC users on dunes in new landing areas.
- Submerged aquatic vegetation on the bayside would be impacted by use because there is no place to land without going through the grasses to the island shore.
- Use would occur in areas of the bay where waters circulate poorly and flush infrequently; as a result, contaminants from PWC emissions could accumulate.

- Impacts to plovers and waterfowl, along with visitor use conflicts, would occur on the oceanside.

Current management restrictions under the Park Superintendent's Compendium limit PWC use spatially. Park staff considered temporal restrictions to protect nesting habitat, for example, but decided they were not feasible because restrictions normally occur during PWC use seasons in spring/summer. Areas could only be open in the winter months, when very little PWC occurs.

Other management strategies that were considered and rejected included charging user fees, allowing only four-stroke engines, or requiring insurance. These strategies could not be implemented due to lack of staff and labor time.

**TABLE 1: SUMMARY OF ALTERNATIVES**

	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	Take No Action to Continue PWC Use Under a Special Regulation
PWC Management	Allow PWC use under a special regulation.	Allow PWC use under a special regulation.	Allow PWC use under a special regulation.	Allow PWC use until April 2002, then ban.
PWC Use Area	Close all areas within the national seashore to PWC use except Ocean City Inlet (south of channel markers from buoy 10 to 11), Sinepuxent Bay between SAV markers and the seashore boundary, and Little Beach.	Same as alternative A except close the area in Sinepuxent Bay between the SAV markers and the seashore boundary.	Same as alternative B.	Close all areas within the national seashore closed to PWC use.
Other Restrictions	No other restrictions.	No other restrictions.	A no-wake restriction would be enforced within the national seashore areas open to PWC use.	No PWC use within the national seashore.
Engine Type	No restrictions.	No restrictions.	No restrictions.	No PWC use within the national seashore.
Use Hours	Between sunrise and sunset.	Between sunrise and sunset.	Between sunrise and sunset.	No PWC use within the national seashore.
PWC Numbers	No limits.	No limits.	No limits.	No PWC use within the national seashore.
State Regulations	Continue to enforce Maryland and Virginia regulations, where applicable.	Continue to enforce Maryland and Virginia regulations, where applicable..	Continue to enforce Maryland and Virginia regulations, where applicable.	No PWC use within the national seashore

TABLE 2: SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
<b>Water Quality</b>	<p>PWC use within the national seashore would result in negligible impacts for all ecotoxicological benchmarks from 2002 through 2012. For human health benchmarks, impacts would be negligible for benzo(a)pyrene throughout the assessment period. Impacts from benzene would be minor to moderate in the Ocean City Inlet, but moderate to negligible or minor from 2002 to 2012 in Sinepuxent Bay and Little Beach. The short half-life of benzene would further reduce its estimated impacts. Pollutants would be rapidly dispersed in the Ocean City Inlet by intense flushing action, substantially reducing concerns to human health from MTBE and benzene. On a cumulative basis the decline in pollutants as a result of EPA's emission requirements would have a beneficial, long-term impact on the local water quality. Impacts would be negligible for all ecotoxicological benchmarks and negligible to minor for benzo(a)pyrene based on human health benchmarks. For benzene and MTBE, impacts are expected to be moderate to major in 2002 in all areas, decreasing to minor to moderate by 2012. Monitoring for benzene and MTBE should be done in all areas to verify whether projected levels are correct and whether other mitigating measures might be required (such as allowing only four-stroke engines for boats and personal watercraft). No impairment to water quality is expected in any area under this alternative.</p>	<p>This alternative would have impacts similar to those described for alternative A in the Ocean City Inlet and Little Beach. Impacts for ecotoxicological benchmarks would be negligible throughout the assessment period. Impacts for human health benchmarks would range from negligible to moderate in 2002, decreasing to minor to moderate by 2012. There would be beneficial impacts in Sinepuxent Bay as a result of prohibiting PWC use within the national seashore in this area. On a cumulative basis the rapid dispersal of pollutants and the extent of current use at the northern and southern landing sites would result in negligible to moderate impacts on water quality. Reductions in pollutants by 2012 would have a beneficial long-term impact on local water quality at both inlets. However, MTBE and benzene loadings would continue to be moderate to major in 2002, decreasing to minor to moderate in 2012. Monitoring for benzene and MTBE should be done in all areas to verify whether projected levels are correct and whether other mitigating measures should be required (such as allowing only four-stroke engines for boats and personal watercraft). No impairment to water quality is expected under this alternative.</p>	<p>Compared to alternative A, this alternative would have beneficial impacts on water quality (pollution and physical impact reduction). Requiring PWC users to operate at no-wake speeds would help reduce near-shore loadings of contaminants, and it could dissuade PWC users from frequenting these sites. This alternative would have a negligible, short-term, adverse effects on water quality in the Ocean City Inlet and Little Beach, and a long-term beneficial impact to aquatic biota of Sinepuxent Bay due to closure of this area to PWC use, thus reducing adverse impacts associated with PWC activities. Based on environmental conditions in the inlets and the extent of current use in to the northern and southern landing sites, plus the additional speed restrictions under this alternative, PWC and boat use would have a negligible to minor cumulative impact on water quality for all ecotoxicological benchmarks and for benzo(a)pyrene (human health). Impacts of benzene and MTBE at Little Beach would be minor to moderate throughout the assessment period. Impacts of benzene and MTBE in Ocean City Inlet would be moderate to major in 2002, decreasing to moderate by 2012. The decline of emission rates between the year 2002 and 2012 would have a long-term, beneficial impact on local water quality at both the Ocean City and Little Beach. No impairment to water quality is expected under this alternative.</p>	<p>Over the short and long term, discontinuing PWC use within the national seashore would have a beneficial impact by contributing to improved water quality conditions in areas currently open to PWC use. On a cumulative basis all area activities, as described for alternative A, would continue to have short-term, moderate to major adverse impacts on local water quality conditions in backbay waters, and a negligible to minor impact in waters of the Ocean City Inlet and Little Beach. Over the long term this alternative would have beneficial impacts on water quality. Water quality would not be impaired.</p>

Table 2: Summary of Environmental Consequences

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
<b>Air Quality</b>				
•Impacts on Human Health	PWC use would continue at existing levels within the national seashore boundary. Alternative A would result in minor adverse impacts for CO and negligible adverse impacts for other pollutants, due to continued PWC use and resulting emissions. Overall, emissions from all boating activities under this alternative would result in moderate adverse impacts for CO, and negligible to minor adverse impacts for other pollutants. This alternative would not result in an impairment of the air quality resource.	The PWC annual emissions for 2002 show that alternative B would result in minor adverse impacts for CO and negligible adverse impacts for the other pollutants of concern. By 2012 impact levels from PWC use would be negligible. The cumulative impacts from all boating activities under this alternative would result in moderate adverse impacts for CO, and negligible to minor adverse impacts for the other pollutants throughout the assessment period. This alternative would not result in an impairment of the air quality resource.	PWC annual emissions under alternative C would result in negligible adverse impacts for all criteria pollutants throughout the assessment period. On a cumulative basis alternative C would result in minor adverse impacts for CO in 2002 and 2012 and negligible adverse impacts for the other criteria pollutants, due to continued PWC use and emissions released at sites. The proposed management restriction under this alternative would reduce emission levels due to limits in allowable PWC speeds at the southern landing area beyond state regulations. This alternative would not result in an impairment of the air quality resource.	The no-action alternative would have negligible beneficial impacts on air quality because PWC would be banned from the seashore. The cumulative impacts from all boating activities would be decreased due to less PWC operation and cleaner engine emissions, but would still result in minor adverse impacts for CO and negligible impacts for other pollutants. This alternative would not result in an impairment of the air quality resource.
•Impacts on Air Quality Related Values	PWC annual emissions would result in negligible adverse impacts for all pollutants. Currently, there is no perceptible qualitative visibility impacts or observed ozone injury to plants. The cumulative impacts from all boating activities would result in negligible to minor adverse impacts, decreasing to negligible by 2012. This alternative would not result in an impairment of air quality related values.	Same as alternative A.	Same as alternative A except cumulative impacts would be negligible throughout the assessment period.	Banning PWC would have beneficial impacts on air quality related values. Impacts to visibility, wildlife, and plants from airborne pollutants related to all other boating activities would be negligible throughout the assessment period. This alternative would not result in an impairment of air quality related values.
<b>Soundscapes</b>	PWC use would continue to be a minor adverse impact at the northern landing area and a minor to moderate adverse impact at Sinpuxent Bay and Little Beach. Impact levels would be related to the number of PWC operating, as well as the sensitivity of other visitors and other visitor activities occurring within the area. The cumulative impacts of boating noise, ambient noise levels, and PWC would continue to range from negligible to moderate, depending on location. Projected increased PWC use levels would not	Removing PWC use from the Sinpuxent Bay area would have a beneficial effect, while impacts at the Ocean City Inlet landing area impacts would be minor, short-term, adverse impacts, and at Little Beach they would be minor to moderate. Cumulative impacts would be similar to alternative A. Fishing boats, sailboats, canoers, and kayakers frequenting the Sinpuxent Bay area would still experience minor adverse impacts due to PWC and boat noise from outside the national seashore boundary and other boat noise from within the boundary.	Removing PWC use from the Sinpuxent Bay area would reduce the intensity of adverse impacts in the area to minor (similar to alternative B). Impacts at the Ocean City Inlet landing area and the Little Beach landing area would be reduced to short-term, potentially negligible to minor adverse impacts as a result of speed restrictions. Fishing boats, sailboats, canoers, and kayakers frequenting the Little Beach landing area would still experience negligible adverse impacts due to PWC and boat noise from outside the national sea-	Prohibiting PWC use within the national seashore would result in a negligible beneficial impact at the northern landing area due to the variety of ongoing activities and the substantial ambient noise level now. Discontinuing PWC use in Sinpuxent Bay would have the same impact as alternative B. Little Beach would experience minor beneficial impacts; the area experiences limited boat traffic currently, so ambient noise level not produced by natural processes would continue. Other boating activity and their noise sources would

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
	<p>increase the severity of noise impacts and would remain short-term impacts during daylight hours in summer.</p> <p>Implementation of this alternative would not result in an impairment of the soundscape.</p>	<p>Implementation of this alternative would not result in an impairment of the soundscape.</p>	<p>shore boundary and other boat noise from within the boundary.</p> <p>Implementation of this alternative would not result in an impairment of the soundscape.</p>	<p>continue to have negligible to minor adverse impacts within the national seashore.</p> <p>This alternative would not result in impairment of the soundscape.</p>
<b>Wildlife and Wildlife Habitat</b>	<p>PWC use in the vicinity of the northern landing area would have minor to moderate, short-term, adverse effects on wildlife, such as shorebirds using the landing area and adjacent areas and other species such as fish that use nearshore habitats to forage for food. However, effects would be minor to moderate because species sensitive to a high level of noise and human activity are not expected to regularly use the landing area or immediately adjacent habitats during periods of high human use.</p> <p>The intensity of PWC use near the south landing area would be much less than near the north landing area. However, wildlife species using marsh and shoreline areas near the south landing area would be less accustomed to high levels of human activity and noise. Occasional nearshore PWC use in this area would have moderate adverse effects on wading and shorebirds, waterfowl, and other wildlife by disrupting normal nesting, foraging, or resting activities.</p> <p>On a cumulative basis wildlife and wildlife habitats that are dispersed throughout the national seashore would experience moderate adverse impacts from visitor uses (including PWC use). All wildlife impacts would be temporary and short term. This alternative would not impair wildlife or wildlife habitat.</p>	<p>Minor, short-term, adverse impacts on wildlife species near the northern landing area are expected, and moderate, short-term adverse impacts near the southern landing area, similar to those discussed for alternative A. However, prohibiting PWC use in Sinepuxent Bay within the national seashore boundary would increase the buffer between nearshore and shoreline habitats, lessening potential impacts to species that use these habitats to negligible, short-term, adverse impacts.</p> <p>On a cumulative basis, short-term moderate adverse indirect impacts to wildlife and habitat are expected under alternative B, similar to alternative A.</p> <p>This alternative would not impair wildlife or wildlife habitat.</p>	<p>Alternative C would minimize potential adverse impacts of PWC use at the northern and the southern landing areas to negligible, short-term, adverse impacts. Effects of implementing no-wake requirements in the northern landing area would be minimal, especially during high use periods, due to background conditions, while speed restrictions and reduced noise in the southern landing area would potentially have a greater effect.</p> <p>On a cumulative basis, there would be minor, short-term, adverse indirect impacts to wildlife and habitat resulting from the combined effects of boat and PWC use under alternative C.</p> <p>This alternative would not impair wildlife or wildlife habitat.</p>	<p>The no-action alternative would have short- and long-term minor beneficial effects from eliminating PWC use within the national seashore boundary, reducing PWC-related noise impacts and intrusions in wildlife habitat.</p> <p>On a cumulative basis, minor, short-term adverse indirect impacts on wildlife due to noise would still occur as a result of PWC use adjacent to the national seashore boundary and other motorized use.</p> <p>This alternative would not impair wildlife or wildlife habitat.</p>

Table 2: Summary of Environmental Consequences

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
<b>Aquatic Fauna</b>	There would be minor to moderate adverse effects on aquatic fauna, particularly in the Ocean City Inlet and Sinepuxent Bay. On a cumulative basis moderate, long-term adverse impacts could be possible with an increase in watercraft use in the Ocean City Inlet, while less use in the vicinity of the southern landing area could produce minor to moderate adverse effects. No impairment to aquatic fauna is expected.	This alternative would have a beneficial impact to aquatic fauna from a reduction in underwater noise in the Sinepuxent Bay area within the national seashore. Similar to alternative A, a reduction in emissions due to new technologies would contribute to reduced noise. In Ocean City Inlet and at Little Beach, impacts would be similar to those described for alternative A. PWC use would have a minor to moderate adverse effect on aquatic fauna. The long-term cumulative effects would be similar to those of alternative A. However, banning PWC use in Sinepuxent Bay would create long-term beneficial impacts in this area. No impairment of aquatic fauna is expected.	PWC use restrictions would contribute to a reduction in underwater noise in near-shore areas, particularly in Sinepuxent Bay. However, fauna living in littoral environments (e.g., marshes) would still incur minor impacts. On a cumulative basis, no change is expected in deeper waters and in areas outside the national seashore's jurisdictional limits, so impacts would be the same as alternative A. No impairment of aquatic fauna is expected.	There would be beneficial, long-term impacts to the underwater soundscape of Assateague. Cumulative impacts would be similar to alternative A except beneficial, long-term impacts could be expected from a reduction of PWC use in NPS jurisdictional waters (400 feet and more from shore). No impairment of aquatic fauna is expected.
<b>Threatened, Endangered, or Special Concern Species</b>	Piping plovers are not likely to be adversely affected by PWC use at the northern or southern landing area or in Sinepuxent Bay due to the distance of the landing areas from nesting areas and access restrictions around piping plover nesting areas during the nesting season. Loggerhead sea turtles are not likely to be adversely affected by PWC use in the northern or southern landing area or in Sinepuxent Bay because they rarely use Maryland locations as nesting sites, and nesting activities occur at night. Foraging activities of bald eagles could potentially be affected by PWC use in the southern landing area; however, because PWC use in this area is limited, adverse effects on the species are not likely. No effects to the Delmarva fox squirrel or seabeach amaranth are expected because these species do not occur in areas affected by PWC use. Cumulative impacts are not likely to adversely affect	Piping plovers and loggerhead sea turtles are not likely to be adversely affected by PWC use, as described for alternative A. Foraging activities of bald eagles could potentially be affected by PWC use near the southern landing area, however, PWC use would be limited in this area, thus minimizing the potential for adverse effects. No effects to the Delmarva fox squirrel or seabeach amaranth are expected. Cumulative impacts are not likely to adversely affect threatened, endangered, or special concern species, as discussed for alternative A. This alternative would not impair threatened, endangered, or special concern species.	Piping plovers and loggerhead sea turtles are not likely to be adversely affected by PWC use, as described for alternative A. Foraging activities of bald eagles could potentially be affected by PWC use near the southern landing area, however PWC use is limited in the area, thus minimizing the potential for adverse effects. Implementing no-wake zones would further minimize potential of disturbance to piping plovers or bald eagles by reducing noise levels in nearshore areas. No effects to the Delmarva fox squirrel or seabeach amaranth are expected. Cumulative impacts would be the same as alternative A. Existing background noise, especially in the vicinity of the northern landing area, would minimize the effects of implementing alternative C. This alternative would not impair threatened, endangered, or special concern species.	Eliminating PWC use within national seashore boundaries would ensure that no PWC-related impacts would occur to threatened or endangered species within the national seashore boundary. While a reduction in noise levels and other disturbances associated with PWC use would have beneficial effects, the effects would be minimal on a cumulative basis when considering existing background conditions, particularly in the vicinity of the northern landing area. This alternative would not impair threatened, endangered, or special concern species.

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
	threatened, endangered, or special concern species in Assateague Island National Seashore. This alternative would not impair threatened, endangered, or special concern species.			
<b>Shoreline Vegetation</b>	<p>Impacts to shoreline vegetation in the northern and southern landing areas would result primarily from foot traffic associated with access by PWC users to beach areas. In the southern landing area additional impacts to marsh habitats could also occur as a result of PWC use in the shallow water habitats. Impacts would be minor because use of this area is limited and because PWC users would likely avoid operating in shallow water habitats to prevent damage to their craft.</p> <p>Cumulative impacts to shoreline vegetation are expected. No impacts are expected at the northern landing area because the shoreline is characterized by an unvegetated beach, although some vegetation along trails to beaches could be trampled by PWC and non-PWC visitors. Direct impacts to marsh vegetation resulting from mechanical removal or damage from collision could occur within Sinepuxent Bay and in the area of Little Beach, but are expected to be minor. Indirect impacts due to modification of substrates (i.e., scouring) from PWC operation in shallow water habitats could also occur. No impairment to shoreline vegetation due to PWC use is expected.</p>	<p>Impacts to shoreline vegetation in the northern and southern landing areas would be similar to those described for alternative A and would result primarily from foot traffic associated with PWC user access to beach areas. In the southern landing area additional impacts to marsh habitats could occur as a result of PWC use in shallow water habitats, but this impact is expected to be minor due to limited use of the area and the fact that PWC users generally avoid shallow water areas. Closing the area of Sinepuxent Bay within the national seashore boundary would not affect shoreline vegetation in this area.</p> <p>Like alternative A, cumulative impacts to vegetation at the northern landing area and in the area of Little Beach would occur, but are expected to be minor.</p> <p>No impairment to shoreline vegetation due to PWC use is expected.</p>	<p>Impacts to shoreline vegetation near the northern and southern landing areas would be the same as those described for alternative A and would result primarily from foot traffic associated with PWC user access to beach areas. The no-wake zones would not change the effect on shoreline vegetation at the northern or southern landing area since beaching and visitor hiking in these area would continue. In the southern landing area additional impacts could occur to marsh habitats as a result of PWC use in the shallow water habitats; however, these impacts would be minor because of limited PWC use and because PWC users tend to avoid shallow water areas.</p> <p>Closing Sinepuxent Bay within the national seashore to PWC use would not have a protective effect on shoreline vegetation.</p> <p>Cumulative impacts would be similar to alternative A, with a reduced potential for modification of substrates.</p> <p>No impairment to shoreline vegetation due to PWC use is expected.</p>	<p>Effects to shoreline vegetation from closing Assateague Island National Seashore to PWC use would be minor, beneficial, and long term.</p> <p>On a cumulative basis beneficial effects would be minor because of continued foot traffic associated with other visitors in the vicinity of the northern and southern landing areas.</p> <p>No impairment to shoreline vegetation is expected.</p>
<b>Submerged Aquatic Vegetation</b>	<p>Impacts to SAV communities resulting from PWC use in designated use areas would be negligible to minor.</p> <p>Cumulative impacts to SAV communities are expected to be negligible because</p>	<p>Impacts to SAV communities resulting from PWC use in designated areas would be negligible in the northern and southern landing areas and beneficial in the portion of Sinepuxent Bay closed to PWC use.</p>	<p>Impacts to SAV communities resulting from PWC use in designated use areas would be negligible. Restricting PWC use to the northern and southern landing areas and implementing no-wake zones would minimize the</p>	<p>Eliminating PWC use within the national seashore boundaries would ensure that SAV communities would no longer be impacted by such use. Benefits would be greatest in the area of known SAV beds in</p>



Table 2: Summary of Environmental Consequences

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
	PWC use and commercial clam dredging are restricted in areas along the national seashore where SAV beds have been documented. Negligible to minor adverse effects could occur to submerged vegetation if communities spread into areas that are designated for PWC and other marine watercraft uses. No impairment to SAV communities due to PWC use is expected.	Cumulative impacts to SAV communities would be negligible to potentially minor in designated use areas and beneficial in Sinepuxent Bay due to prohibiting PWC use and the resultant creation of a buffer between existing SAV beds and PWC use areas. No impairment to SAV communities due to PWC use is expected.	potential for impacts on submerged vegetation in areas that have not been delineated. Cumulative impacts to SAV are expected to be negligible because PWC and other watercraft use would be restricted to areas outside the national seashore and outside areas where SAV communities are documented. No impairment to SAV communities due to PWC use is expected.	the Sinepuxent Bay area of the seashore and potential non-delineated beds at the southern end of the island. Negligible cumulative impacts to SAV beds occurring within national seashore boundaries are expected as long as conventional watercraft continue to operate within some areas of the national seashore. No impairment to SAV communities is expected.
<b>Visitor Experience</b>	Continued PWC use would result in negligible to moderate adverse impacts on the visitor experience, depending on location and seasonal variations in use. At Little Beach there would be a moderate adverse impact between PWC users, birdwatchers, and fishermen during summer. Conflicts with other boaters, fishermen, and swimmers would continue adjacent to the Ocean City Inlet and south of the jetty. Cumulative impacts related to all other watercraft and other visitors would continue to result in negligible adverse impacts, since little noticeable change in the visitor experience would occur. Most visitors would continue to be satisfied with their experiences.	Continued PWC use would result in negligible to moderate adverse impacts on the visitor experience, depending on location and seasonal variations in visitor use, as described under alternative A. The potential for conflict between PWC users and other park users at the northern and southern landing areas would continue; however, it would be eliminated in Sinepuxent Bay, improving visitor satisfaction in the area of Sinepuxent Bay. Cumulative effects of PWC use, other watercraft, and other visitor activities would continue to result in negligible adverse impacts, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences at the national seashore. PWC-related impacts would be removed from Sinepuxent Bay, but other uses would continue in this area.	Impacts to visitor experiences would be reduced to negligible to minor. There would be a negligible to minor adverse impact to PWC users as a consequence of the no-wake zone speed limits. However, PWC user access to the seashore would remain. Similar to alternative A, cumulative impacts related to personal watercraft, other boats, and visitors would be negligible, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences at the national seashore.	Impacts to visitor experiences would be reduced to negligible levels for non-PWC users and would remain minor for PWC users as they would be required to go elsewhere. No adverse cumulative impacts within the national seashore boundary are expected. Banning PWC use within NPS jurisdictional water could encourage users to frequent waters used by others (e.g., other boaters), creating a minor adverse cumulative impact in those areas.
<b>Visitor Safety</b>	Although the number of PWC users is not expected to substantially increase over the next 10 years, alternative A would result in negligible to moderate adverse impacts as congestion (created by all boat types) increased. The capability of NPS staff to enforce boating laws would depend directly on the presence of patrols in use areas. Consequently, the potential	Alternative B would reduce the potential for PWC-related accidents within the Sinepuxent Bay area of the national seashore to negligible. At the northern and southern landing areas, existing conditions would continue, with negligible to moderate adverse impacts to visitor safety.	Alternative C would reduce to negligible the potential for PWC-related accidents within the Sinepuxent Bay area of the national seashore and in the shoreline waters where swimmers are likely to be found. No-wake restrictions at the northern and southern landing areas would reduce the potential for accidents to negligible to possibly minor adverse impacts. An increased	Because many of the other uses in the national seashore are related to motorized watercraft and other water-oriented activities, the potential for accidents is always present, therefore the overall reduction in accident potential resulting from banning PWC use would be negligible to minor. This alternative would result in negligible impacts to visitor safety from PWC use. This is due

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
	for long-term impacts to visitor safety (potential conflict between PWC users and swimmers and/or boaters) would be substantial and considered to be a moderate adverse impact.		potential for accidents between PWC users and other boaters could occur in the Ocean City Inlet and in Sinepuxent Bay outside NPS waters. This impact would be considered negligible to minor.	to the potential for increased safety hazards to other boaters operating in adjacent non-NPS waters, with a possible increase in PWC activities in those areas.
<b>Socioeconomic Environment</b>	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.
<b>National Seashore Operations and Management</b>				
Enforcement Needs	Existing PWC use, as well as existing boat activity, would require additional park staff and funding. Improving park operations to meet existing needs would also be adequate to manage PWC regulations under this alternative. Impacts would be minor to moderate and long-term due to existing needs for additional law enforcement capability within the national seashore.	Same as alternative A.	Same as alternative A.	There would be minor to moderate, long-term impacts to the enforcement needs of the park resulting from banning PWC use; once the ban was understood and observed by PWC users, impacts would be minor. Because park enforcement capabilities are already taxed, additional enforcement requirements would increase the need for additional personnel.
Conflict with State and Local Ordinances	PWC and boating regulations within the national seashore boundaries would be the same as or less stringent than Maryland regulations and more stringent than Virginia regulations. Within the Maryland portion of the national seashore additional PWC regulations adopted October 1, 2001, would have negligible adverse impacts on PWC use in these areas. Park regulations under alternative A would have no effect on state and local ordinances.	Same as alternative A.	Same as alternative A.	Because PWC use would no longer be allowed within the national seashore, park regulations would be more restrictive than state or local regulations in either Maryland or Virginia. Park regulations would have no effect on state and local ordinances within the park boundaries.

## **AFFECTED ENVIRONMENT**

Assateague Island National Seashore is one of two barrier islands in Maryland that define the state's coastal bay system (Bohlen and Boynton n.d.). Coastal barriers, such as Assateague Island, are unique land forms that provide protection for diverse aquatic habitats and serve as the mainland's first line of defense against the impacts of severe coastal storms and erosion. Located at the interface of land and sea, the dominant physical factors responsible for shaping coastal land forms are tidal range, wave energy, and sediment supply from rivers and older, pre-existing coastal sand bodies. Relative changes in local sea level also profoundly affect coastal barrier diversity. The following six characteristics define coastal barriers (USFWS 2000):

They are subject to the impacts of coastal storms and sea level rise.

They buffer the mainland from the impact of storms.

They protect and maintain productive estuarine systems which support the Nation's fishing and shellfishing industries.

They consist primarily of unconsolidated sediments.

They are subject to wind, wave, and tidal energies.

They include associated landward aquatic habitats, which the non-wetland portion of the coastal barrier protects from direct wave attack.

Coastal barriers protect the aquatic habitats between the barrier and the mainland. Together with their adjacent wetland, marsh, estuarine, inlet, and nearshore water habitats, coastal barriers support a tremendous variety of organisms. Millions of fish, shellfish, birds, mammals, and other wildlife depend on barriers and their associated wetlands for vital feeding, spawning, nesting, nursery, and resting habitat. The barrier and its associated habitats are one ecological system, and the health and productivity of the entire system depend on the rational use of all the component parts.

The western boundary of the park includes the waters of Sinepuxent Bay in the northern portion of the island, Chincoteague Bay in the mid portion of the island, and Tom's Cove in the southernmost portion of the island. The Atlantic Ocean comprises the eastern boundary.

## **WATER RESOURCES**

Sensitive aquatic systems around Assateague Island that may be affected by water quality include, among others: submerged aquatic vegetation and associated fauna, marshes, resident and non-resident nektonic communities (fish, reptiles, and marine mammals), and shellfisheries. The following section describes existing water quality conditions that have a direct impact on these aquatic systems.

### **SURFACE WATER**

Assateague Island National Seashore is within the Chincoteague watershed. This watershed is part of Maryland and Virginia's coastal bays watershed system. The coastal area in this region is comprised of five major bays, including the Sinepuxent, Chincoteague, Newport, Isle of Wight, and the Assawoman Bays. Low topographic relief, high water tables, poor surface drainage, sandy soils, and an abundance of wetlands characterize these coastal areas. Like all of Maryland's coastal bays along the barrier islands, Sinepuxent and Chincoteague Bays are shallow lagoons, with an average depth of

1.2 meters (4 feet), and wind, waves, and tidal currents readily mix the waters (Bohlen and Boynton n.d.).

Natural barrier islands, such as Assateague Island National Seashore, typically experience processes such as overwash events (tidal flows and waves overwash a barrier island transporting sediment from the coastal dunes to the lee of the islands where it is deposited forming characteristic overwash fans) and the formation of tidal shoals. These processes control circulation patterns throughout the coastal bays. Inlets are essential for creating circulation and flushing patterns, thus maintaining healthy water quality. Due to the flushing patterns, freshwater contributions, wind, waves, and the physical characteristics (shallow depths), there is little difference in water quality conditions between the surface and bottom waters in the open portions of Maryland's coastal bays (Bohlen and Boynton n.d.). Table 3 describes the physical characteristics of both the Sinepuxent and Chincoteague Bays.

**TABLE 3: PHYSICAL DESCRIPTION OF SINEPUXENT AND CHINCOTEAGUE BAYS**

Coastal Bay	Surface Area (acres)	Average Depth (feet)	Volume (ac-ft)	Drainage Area (acres)	Watershed to Surface Area Ratio
Sinepuxent Bay	6076	2.2	13367	6595	1.1
Chincoteague Bay, MD	46683	4.0	186732	34827	0.7

Source: Boynton et al. 1996

The depth of the navigational channel within the Ocean City Inlet ranges from 8 to 12 feet. The Chincoteague Inlet has depths ranging between 2 and 17 feet and offers a much wider area for PWC maneuvering and the dispersion of surface water contamination. The flushing of waters during both ebb- and floodtides is very high, with approximately 765.5 million cubic feet being exchanged with the ocean in every half-tidal cycle.

Mean surface water temperatures in 2000, measured in the inlets, did not differ significantly from temperatures measured for the last 13 years. These temperatures ranged between 13 and 18°C. At the Ocean City and Chincoteague Inlets temperatures have smaller variances around the mean due to the mitigating influences of ocean water exchange (O'Connell 2001). These conditions favor a rapid dilution of contaminants originating from marine engine emissions. Although the bays exhibit relatively healthy conditions, water circulation is limited. It is estimated that it takes approximately 63 days for 99% of the water in Chincoteague Bay to be replaced by tidal exchange (Pritchard 1960). Sinepuxent Bay has a greater tidal exchange and higher tidal currents than Chincoteague Bay because of its location near the Ocean City Inlet. However, despite its proximity to Ocean City Inlet, the Sinepuxent Bay area (together with the Chincoteague Bay area) has been classified as stagnant, with only 7.5% of the water volume replaced each day by freshwater or tidal flows (NPS 1991). As a result of low tidal exchange rates, sediments, nutrients, pathogens, and toxic materials from surrounding land uses tend to remain in Sinepuxent and Chincoteague Bays for longer periods of time (Boynton et al. 1996).

At Assateague Island National Seashore, net freshwater input, evaporation rates, and exchange rates through the two inlets controlling tidal waters indicate that approximately 7% of the volume of the bay waters (Chincoteague, Sinepuxent, and Newport Bays) is renewed each day. These exchange rates are relatively low. The area of the water surface at mean low water (MLW) is 3,536 million square feet, and the volume of water at MLW is 14,494 million cubic feet. The volume of water in the area at mean tide is increased to 16,025 million cubic feet (Pritchard 1960). The volume of water entering the bays through the north and south inlets is similar. Consequently, pollutant contributions during flood-tides create accumulation of contaminants towards the center portions of the bays.

## **WATER QUALITY**

### **FEDERAL/STATE REGULATIONS AND STANDARDS**

The U.S. Environmental Protection Agency has developed national recommended water quality criteria for priority pollutants in ambient water for the protection of aquatic life and human health (US EPA 1998). These criteria have been adopted as enforceable standards by most states. The Clean Water Act and Federal Pollution Control Act regulate and protect all national waters. Under these laws all states must submit a 305(b) report, which characterizes the quality of their waters on a watershed level, and a 303(d) list, which establishes which specific water bodies do not meet the federal or state water quality standards for its designated use(s). The watersheds are rated as follows (VADCR 1998):

- Category I: The watershed is in need of restoration and does not meet clean water and natural resource goals.
- Category II: Watersheds are meeting goals and may need action to maintain standards.
- Category III: Watersheds have pristine or sensitive aquatic conditions (most of these are designated as wilderness, wild and scenic rivers, or outstanding natural resource waters).
- Category IV: Watersheds do not have sufficient data to make an assessment.

The majority of the Maryland and Virginia water quality standards remain consistent with the federal criteria and regulations established by the Environmental Protection Agency, including EPA's antidegradation policy (40 CFR 131.12[a][1-3]), which require states to adopt policies that establish three tiers of protection:

- Tier 1: Water quality is necessary to support existing uses is maintained.
- Tier 2: Water quality is better than the minimum level necessary to support protection and propagation of fish, shellfish and wildlife, and recreation in and on the water ("fishable/swimmable"), and water quality is also maintained and protected unless, through a public process, some lowering of water quality is deemed necessary to accommodate important economic or social development.
- Tier 3: Waterbodies are of exceptional recreational or ecological significance, and water quality is maintained and protected.

Maryland classifies its waters based on seven use designations (COMAR 26.08.02.08):

- Use I: protects for fish and aquatic life and contact recreation (fishable/swimmable waters), and for the protection of industrial and agricultural uses
- Use I-P: protects for all above uses plus use for public water supply
- Use II: protects for all of above uses plus use for shellfish harvesting
- Use III: protects for all of the above uses, plus use for natural trout propagation and growth
- Use III-P: protects for all above uses plus use for public water supply
- Use IV: protects for all of the above uses, plus use for recreational trout waters (managed as a fishery by periodic stocking)
- Use IV-P: protects for all of above uses plus use for public water supply

Sinepuxent and Chincoteague Bays in Maryland are designated as use II waterbodies. To establish and regulate the designated uses, Maryland has developed numeric standards for levels of toxics, dissolved oxygen, turbidity, bacteria, and temperature for each use. If these waters do not meet the numeric water quality standards for the designated uses, then the waterbody is listed as impaired on the 303(d) list as described in the state's 305(b) report.

Virginia's methods for characterizing waterbodies differ from those in Maryland. Virginia has established criteria that first determine the class of the waterbody and then determine the supporting use of the waterbody. According to the *Virginia Administrative Code* (9 VAC 25-260-50), the Chincoteague Bay is class II estuarine water (tidal water-coastal zone to fall line). Each class of water has its associated dissolved oxygen, pH, and temperature requirements. Once the class of water is determined, Virginia designates all waters with all designated uses for the protection of aquatic life, fish consumption use, shellfish consumption use, swimming use, and public water supply use. The Virginia Administrative Code establishes numeric standards for various parameters such as dissolved oxygen, temperature, toxics, bacteria, and metals. These numeric standards determine whether or not a waterbody can support the designated uses. If the waterbody does not meet the numeric standards, it is then considered impaired and placed on the 303(d) list. Like Maryland, Virginia assesses overall water quality based on the ability of the citizens to safely enjoy the designated uses of the waters as described in the Virginia Water Quality Standards. Table 4 summarizes the state and federal water classifications for waters within Assateague Island National Seashore.

**TABLE 4: WATERBODY CLASSIFICATIONS AT ASSATEAGUE ISLAND NATIONAL SEASHORE**

Waterbody	Watershed	State Use Designation <sup>1,2</sup>	303(d) Listed Impairment <sup>3</sup>	Federal Designation: EPA Watershed Category <sup>3</sup>
Sinepuxent Bay	Chincoteague (02060010)	Use II	Nutrients, dissolved oxygen, fecal coliform	Category I
Chincoteague Bay (MD)	Chincoteague (02060010)	Use II	Nutrients, dissolved oxygen, fecal coliform	Category I
Chincoteague Bay (VA)	Chincoteague (02060010)	Class II/All Uses	Shellfish restrictions	Category I

1. COMAR A26.08.02.08.

2. 9 VAC 25-260-50.

3. EPA 1998, VADCR 1998.

The Chincoteague and Sinepuxent Bays do not meet the water quality criteria in both Maryland and Virginia and therefore are considered impaired and have been placed on each state's 303(d) list. According to Maryland's 303(d) list, these waters are impaired for nutrients, dissolved oxygen, and fecal coliform. Although these waters are considered impaired, it does not mean that the waters are violating the designated Use II requirements. The 1998 303(d) list helped to target waters in need of further evaluation (C. Poukish, pers. comm., Oct. 5, 2001, Environmental Health and Risk Assessment Program for Maryland). Virginia's 1998 305(b) report classifies the Chincoteague Bay as impaired for shellfishing. According to the Virginia Department of Environmental Quality, the Virginia Department of Health is the agency responsible for implementing shellfish restrictions. Although the Chincoteague Bay in Virginia has shellfish restrictions, most often these restrictions are seasonal and do not always indicate that the waters are impaired (E. Daub, pers. comm., Oct. 5, 2001, VDEQ).

## OTHER WATER QUALITY DATA

To complement the state water quality assessment programs, in 1987 the National Park Service initiated a four-year water quality monitoring program in both Sinepuxent and Chincoteague Bays to address concerns associated with the potential impacts of

- marina expansions that could add gasoline, oil, and heavy metals to the surface waters
- agricultural runoff from poultry operations on the Delmarva peninsula that could increase nutrient loading and suspended sediment to the bays
- increased residential development on the mainland that could add suspended sediments, metals, and pesticides
- pollutant loading coming from Trappe Creek
- waste disposal associated with camping units
- activities (maintenance, sewage, water treatment) associated with two visitor centers that could contribute to bacteria, oil, and sediment

The National Park Service established nine water quality monitoring stations, four in Sinepuxent Bay and five in Chincoteague Bay. A total of 17 parameters were measured at each station, including depth, temperature, salinity, dissolved oxygen, pH, conductivity, total suspended solids, fecal coliform, total nitrogen and total phosphorous, nitrates, and dissolved ammonium (NPS 1991). The results of the study indicated that water quality in Sinepuxent and Chincoteague Bays was generally good except in localized and confined tidal areas. Using Secchi disk depth measurements, and chemical analyses, the NPS water quality sampling indicated that the water clarity and turbidity in Sinepuxent Bay was slightly better than that in Chincoteague Bay. The maximum mean Secchi disk depth in Sinepuxent Bay was 0.77 meter, while in Chincoteague Bay it was 0.64 meter. Overall, however, the coastal bays exhibited healthy levels of dissolved oxygen and low levels of fecal coliform, compared to the state standards (NPS 1991).

In addition to PWC and other boat uses, potential sources of contaminants at Assateague Island National Seashore include increasing coastal development (e.g., urban runoff), septic systems, recreational usage, marinas, agricultural runoff in the coastal watershed of the Delmarva Peninsula, and atmospheric deposition (NPS, WRD, 1995). Chincoteague Bay water quality is generally good; however, there is elevated chlorophyll, suspended sediments, and nutrient levels due to runoff from streams and poor flushing characteristics of this bay. Sinepuxent Bay water quality in this segment is good on open tidal waters, although there is some degradation in confined tidal waters. Assateague Island National Seashore has a wastewater discharge area (0.01 square mile), so there is a shellfish harvesting restriction as a buffer around the outfall (MDNR 1996).

## **AIR QUALITY**

### **FEDERAL REGULATIONS AND STANDARDS**

The Environmental Protection Agency defines ambient air as “that portion of the atmosphere, external to buildings, to which the general public has access” (40 CFR Part 50). In compliance with the 1970 Clean Air Act and the 1977 and 1990 Clean Air Act Amendments (CAAA), the Environmental Protection Agency has promulgated national ambient air quality standards (NAAQS) and regulations. The standards were enacted for the protection of public health and welfare, allowing for an adequate margin of safety. To date, the agency has issued standards for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), particles with a diameter less than or equal to a nominal 10 micrometers (PM<sub>10</sub>), ozone (O<sub>3</sub>), nitrogen dioxide (NO<sub>2</sub>), and lead (Pb). Areas that do not meet national standards are called non-attainment areas.

There are primary and secondary air quality standards. Primary standards are designed to protect sensitive segments of the population from adverse health effects, with an adequate margin of safety, which may result from exposure to criteria pollutants. Secondary standards are designed to protect human health and welfare and, therefore, in some cases, are more stringent than the primary standards. Human welfare is considered to include both the natural and man-made environments. Each state and locality has the primary responsibility for air pollution prevention and control. Under the Clean Air Act and its amendments, state and local air pollution control agencies have the authority to adopt and enforce ambient air quality standards that are more stringent than the national standards. Maryland and Virginia have adopted the national ambient air quality standards (see Table 5).

**TABLE 5: AMBIENT AIR QUALITY STANDARDS FOR CRITERIA POLLUTANTS**

Pollutant	Federal Standard
Carbon Monoxide (CO) Maximum 8-Hour Concentration Maximum 1 Hour Concentration	9 ppm 35 ppm
Lead (Pb)* Maximum Arithmetic Mean Over Three Consecutive Months	1.5 µg/m <sup>3</sup>
Nitrogen Dioxide (NO <sub>2</sub> )* Annual Arithmetic Mean	0.05 ppm
Ozone (O <sub>3</sub> )* 1-Hour Average 8-Hour Average	0.12 ppm 0.08 ppm
Total Suspended Particulates (TSP) Annual Arithmetic Mean Maximum 24-Hour Concentration	75 µg/m <sup>3</sup> 250 µg/m <sup>3</sup>
Inhalable Particulate Matter (PM <sub>10</sub> )* Annual Arithmetic Mean Maximum 24-Hour Concentration	50 µg/m <sup>3</sup> 150 µg/m <sup>3</sup>
Inhalable Particulate Matter (PM <sub>2.5</sub> )* Annual Arithmetic Mean Maximum 24-Hour Concentration	15 µg/m <sup>3</sup> 65 µg/m <sup>3</sup>
Sulfur Dioxide (SO <sub>2</sub> ) Annual Arithmetic Mean Maximum 24-Hour Concentration Maximum 3-Hour Concentration	80 µg/m <sup>3</sup> 365 µg/m <sup>3</sup> 1,300 µg/m <sup>3</sup>

Source: 40 CFR Part 50, July 1991, "Ambient Air Quality Standards."

ppm = parts per million

µg/m<sup>3</sup>=micrograms per cubic meter

Annual standards never to be exceeded; short-term standards not to be exceeded more than once per year.

Assateague Island National Seashore is designated as a class II airshed, which means that the national seashore's air quality is protected by allowing limited increases (i.e., allowable increments) over baseline concentrations of pollution for the pollutants sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), and particulate matter (PM). Virginia currently has two class I areas and the remainder of the state is designated class II. Facilities affecting both class I and class II areas that have the potential to emit 250 tons of a pollutant, or 100 tons for a specific list of 28 source categories, will need to meet more stringent permitting requirements and to apply their best available control technology (VDEQ 2001).

Assateague Island National Seashore is located within Worcester County, Maryland, Air Quality Control Region (AQCR) 114 Eastern Shore Interstate area and Accomack County, Virginia, Northeastern Virginia Intrastate AQCR (40 CFR 81.12 and 56 FR 56709 Nov. 6, 1991). The Environmental Protection Agency has designated this area as in attainment for all criteria pollutants (ozone, CO, NO<sub>2</sub>, PM<sub>10</sub>, SO<sub>2</sub>, and lead) (US EPA 2001c). Existing ambient air quality levels within or near the study area are monitored by the states and are tabulated in annual reports (see Table 6). All



pollutants examined in the most recent year (2000), including carbon monoxide, PM<sub>10</sub>, sulfur dioxide, nitrogen dioxide, ozone, and lead, are within the standards.

All ambient air quality levels meet the national ambient air quality standards (see Table 5).

**TABLE 6: REPRESENTATIVE MONITORED AMBIENT AIR QUALITY DATA**

Pollutant	Maryland State Monitoring Data (2000)		
	Monitoring Station	Period	1st/2nd Highest
Carbon Monoxide (CO)	Old Town Fire Dept., St. 34 Baltimore, Maryland	1-hour 8-hour	4.7 / 4.6 ppm 3.4 / 3.4 ppm
Sulfur Dioxide (SO <sub>2</sub> )	Jenkins Rd. Elem. School Riviera Beach Anne Arundel County, Maryland	3-hour 24-hour Annual	158.6 / 156.0 µg/m <sup>3</sup> 62.4 / 62.4 µg/m <sup>3</sup> 15.6 µg/m <sup>3</sup>
Particulates (PM <sub>10</sub> )	Wicomico County Health Dept. Salisbury, Maryland	24-hour Annual	40 / 28 µg/m <sup>3</sup> 12.2 µg/m <sup>3</sup>
Ozone (O <sub>3</sub> )	Greenside Drive Cockeysville Baltimore County, Maryland	1-hour	0.114 / 0.107 ppm
Nitrogen Dioxide (NO <sub>2</sub> )	900 "Y" Street, Ft. Meade Anne Arundel County, Maryland	Annual Average	22 µg/m <sup>3</sup>
Lead (Pb) Quarterly Average	Harbor Tunnel Throughway Baltimore, Maryland	Quarterly Average	0.01 µg/m <sup>3</sup>

Source: US EPA 2000a.

ppm = parts per million

µg/m<sup>3</sup> = micrograms per cubic meter

## SOUNDSCAPES

One of the natural resources of Assateague Island National Seashore is the natural soundscape, also referred to as "natural ambient sounds" or "natural quiet." The natural soundscape includes all of the naturally occurring sounds of the seashore, such as calling birds and the surf, as well as the quiet associated with still nights.

"Noise" is defined as unwanted sound. Sounds are described as noise if they interfere with an activity or disturb the person hearing them. When evaluated against the natural soundscape, which is all the sounds of nature in the absence of any human sound, all human sound is considered "noise." This does not, however, imply that all human sounds are inappropriate or unacceptable; such evaluations must consider management guidance such as park purpose, management zoning, resource sensitivity, impacts from the activity, and similar factors.

Sound pressure levels are commonly measured in a logarithmic unit called a decibel (dB). The human ear is not equally sensitive to all sound frequencies, being generally less sensitive to very low and very high frequency sounds; therefore, the A-weighted decibel scale (dBA), which is calibrated to the human ear's response, is often used in impact analysis. Table 9 illustrates common sounds and their associated sound levels using this scale.

**TABLE 7: SOUND LEVEL COMPARISON CHART**

Decibels	How it Feels	Equivalent Sounds	Sound Levels at Various Locations in Assateague Island National Seashore
140-160	Near permanent damage from short exposure	Large caliber rifles (e.g., .243, 30-06)	
130-140	Pain to ears	.22 caliber weapon	Permitted hunting on designated islands
100	Very loud	Air compressor at 20 feet; garbage trucks and city buses	Banner planes flying overhead on the north end of the island

Decibels	How it Feels	Equivalent Sounds	Sound Levels at Various Locations in Assateague Island National Seashore
	Conversation stops	Power lawnmower; diesel truck at 25 feet	
90	Intolerable for phone use	Steady flow of freeway traffic; 10 HP outboard motor; garbage disposal	Standing on the jetty at the Ocean City Inlet
80		Muffled personal watercraft at 50 feet; automatic dishwasher; near drilling rig; vacuum cleaner	Standing on the beach on a windy day Touring the visitor center on a busy day
70		Drilling rig at 200 feet; window air conditioner outside at 2 feet	Park entrance roads on a busy day
60	Quiet	Window air conditioner in room; normal conversation	Sitting on Little Beach in Tom's Cove
50	Sleep interference	Bird calls	Hiking on the woodland trail
40		Library	Viewing a bayside marsh
30		Soft whisper	In a tent at the Pine Tree campsite after sundown
20		In a quiet house at midnight; leaves rustling	

Note: Modified from *Final Environmental Impact Statement, Miccosukee 3-1 Exploratory Well, Broward County, Florida* (U.S. Department of the Interior).

For the average human a 10 dB increase in the measured sound level is subjectively perceived as being twice as loud, and a 10 dB decrease is perceived as half as loud. The decibel change at which the average human would indicate that the sound is just perceptibly louder or perceptibly quieter is 3 dB. There is generally a 6 dB reduction in sound level for each doubling of distance from a noise source due to spherical spreading loss (e.g., if the sound level at 25 feet from a PWC was 86 dB, the sound level at 50 feet would be expected to be 80 dB, at 100 feet 74 dB, etc.).

As with all NPS resources, the opportunity to experience the natural soundscape is part of the visitor experience. The natural soundscape of Assateague Island National Seashore contributes to a positive visitor experience and is a direct or indirect component of why many people visit the park. However, many visitors enjoy recreational activities using motorized watercraft, and noise is a component of that activity; such visitors do not necessarily visit Assateague Island National Seashore for solitude or the soundscape. Visitor surveys regarding PWC noise in relation to visitor experience have not been conducted; therefore, it is difficult to quantify how many visitors enjoy the park for the natural soundscape compared to how many enjoy motorized recreational activities, or if some visitors enjoy both motorized activities and the natural soundscape. Information used in the analysis primarily comes from park staff observations and reports of complaints made formally and informally to park rangers.

Many factors affect how an individual responds to noise. Primary acoustical factors include the sound level, the distribution of sound levels across the frequency spectrum, and the duration (and other time-related factors such as how often it occurs, and timing sensitivity) of the sound. Secondary acoustical factors include the spectral complexity, sound level fluctuations, frequency fluctuation, rise-time of the noise, and localization of the noise source (Mestre Greve Associates 1992).

Non-acoustical factors also play a role in how an individual responds to sounds. Non-acoustical factors vary from the past experience and adaptability of an individual to the predictability of when a noise will occur. The listener's activity will also affect how he/she responds to noise.

Personal watercraft and outboard motors are similar in the actual noise level they generate (in terms of decibels), which is generally around 80 dB or less at 50 feet from a motorized boat or personal watercraft (US EPA 1974) but can range from below 80 to as much as 102 dB (Sea-Doo 2000;

Bluewater Network 2001). However, unlike motorboats, personal watercraft are highly maneuverable and are used for stunts and acrobatics, often resulting in quickly varying noise levels due to changes in acceleration and exposure of the jet exhaust when crossing waves. The frequent change in pitch and noise levels, especially if operated closer to land, make the noise from personal watercraft more noticeable to human ears (Asplund 2001).

#### **NOISE EMISSION LEVELS — MARINE ENGINES**

Studies and investigations by many organizations on different types of personal watercraft, have found that associated noise levels range from about 71 to 105 dB. A 1990 study in Salt Lake City, Utah, recorded PWC sound levels ranging from about 79 to 80.5 dB, where a conventional boat with an inboard engine and underwater exhaust may range from 74 to 83.5 dB (twin engine) and a conventional boat with an outboard engine has a sound level of about 88 dB (twin engine).

Research conducted by the Izaak Walton League indicates that one PWC unit can emit between 85 and 105 dB of sound, and that wildlife or humans located 100 feet away may hear sounds of 75 dB. This study also stated that rapid changes in acceleration and direction may create a greater disturbance and emit sounds of up to 90 dB (Izaak Walton League 1999). Other studies conducted by the New Jersey State Police indicate that a PWC unit with a 100 horsepower engine emits up to 76 dBA, while a single, 175-horsepower outboard engine emits up to 81 dBA. Sea-Doo research indicates that in three out of five distances measured during a sound level test, PWC engines were quieter than an outboard motorboat. Sea-Doo also found that it would take approximately four PWC units, 50 feet from the shore to produce 77 dBA, and it would take 16 PWC vessels operating at 15 feet from the shore to emit 83 dBA of sound, which is equal to one open exhaust boat at 1,600 feet from the shore. In response to public complaints, the PWC industry has employed new technologies on PWC to reduce sound by about 50% to 70% from 1999 models (Sea-Doo 2000). Noise limits have been established by National Park Service and are 82 dB at 82 feet.

EPA research also indicated that one PWC unit operating 50 feet from an onshore observer emits a sound level of 71 dBA, and studies conducted using the Society of Automotive Engineers found that two PWC operating 50 feet from the shore emit similar sound levels of about 74 dBA (PWIA 2000).

#### **AREAS SENSITIVE TO NOISE — ASSATEAGUE ISLAND NATIONAL SEASHORE**

Noise levels vary from the north and south ends of the island (see Table 7). Noise levels at the north end of the island are affected by PWC use in the transportation corridor and outside the national seashore boundary. The two most common areas for PWC and other motorized watercraft use at Assateague Island National Seashore are the Ocean City Inlet and Sinepuxent Bay. Noise sources at the Ocean City Inlet area include powerboats, personal watercraft, commercial vessels, background noise from the town of Ocean City, and small aircraft. Little Beach (southern end of Assateague Island) is quieter, with fewer personal or motorized watercraft generating noise in the area. Noise in Sinepuxent Bay is produced primarily by personal and other motorized watercraft, and traffic crossing the SR 611 bridge. Typical southwest winds prevail in this area year-round and may reduce the impact of noise on visitors frequenting the northern section of Assateague Island.

Other motorized vessels (commercial fishing boats, charter boats, touring boats, sea rockets, ocean racing boats) also contribute to noise levels in the area and within the seashore boundary. Ocean City is approximately 1,500 feet from the northern end of the island. Noise from Ocean City, including watercraft and the boardwalk (carnival rides), can be heard from the northern portions of the seashore.

Various types of watercraft, ranging in size from 16 feet to 50 feet or more, use the Ocean City Inlet as an access route and transportation corridor. Smaller boats in this area use outboard engines, similar to PWC engines, with 15 to 130 horsepower. Larger fishing and performance vessels use both inboard and outboard diesel (compression ignition), ranging from 90 to 660 horsepower. Altogether, noise related to boating activity and background noise at the Ocean City Inlet is very high. Natural sounds can be heard occasionally; motorized noise is the primary noise, especially during daylight hours, but it is not overly disruptive to visitor activities in the study area.

The southern landing area at Little Beach (Chincoteague Inlet) is typically quieter, with fewer watercraft, than the Ocean City Inlet, and there are abundant wildlife (e.g., waterbird colonies containing yellow-crowned night heron) in the vicinity of the landing site. Consequently, PWC-generated noise caused by frequent changes in pitch and loudness from rapid acceleration, deceleration, and change of direction noticeably intrudes on natural soundscape.

Other park users contribute to the soundscape of Assateague Island National Seashore, including beach users, hikers, surfers, four-wheel drive enthusiasts, canoers, and kayakers. However, visitors consider these sounds compatible with park uses.

## **WILDLIFE AND WILDLIFE HABITAT**

### **MAMMALS**

Marine mammals are common transient species in waters surrounding Assateague Island National Seashore. Species include bottlenose dolphin, common dolphin, striped dolphin, harbor porpoise, pilot whale, humpback whale, and sperm whale. They have been observed swimming in the vicinity or washed up on the beach (K. Toulhey, NMFS, pers. comm., Sept. 6, 2001).

Mammals known to occur in the Assateague Island area include river otter, meadow vole, least shrew, muskrat, and rice rat in the salt and freshwater marshes around the island (Bashore and NPS n.d.). Larger mammals such as white-tailed deer, the introduced Sika deer, and the introduced ponies may be found feeding in marshy areas as well. Species common to the region (i.e., opossum, raccoon, gray squirrel) have been documented within the national seashore.

### **AMPHIBIANS AND REPTILES**

Amphibian species common to the national seashore include Fowler's toad, green treefrog, bullfrog, green frog, and Southern leopard frog. Reptile species include sea turtles (loggerhead, Atlantic green, and leatherback), as well as the common snapping, Eastern painted, Eastern box, and Eastern mud turtles. Common snake species include the Northern black racer, black rat snake, Eastern hognose snake, Northern water snake, and Northern brown snake (Mitchell, Anderson, and Schwaner 1993).

### **BIRDS**

Approximately 300 species of birds have been identified at Assateague Island National Seashore and the Chincoteague National Wildlife Refuge (see Table 8 for examples). Assateague Island is located along the Atlantic flyway for shorebirds, waterfowl, and other birds that nest in the north and migrate south for the winter. The salt marshes, pinewoods, and freshwater impoundments on the island are also nesting places for a variety of birds, including species of plovers, gulls, terns, geese, herons, and ducks

(USFWS 1997). In addition, intertidal beach zones along the ocean and mudflats and marsh habitats along back bays provide excellent foraging and resting habitats for both resident and migratory bird species.

During the winter the inlet and rock jetties adjacent to the northern PWC landing area attract a variety of diving ducks, eiders, and shorebirds, including purple sandpipers and ruddy turnstones that utilize the jetties and adjacent inlet for foraging and resting.

**TABLE 8: AVIAN SPECIES COMMON TO ASSATEAGUE ISLAND NATIONAL SEASHORE**

Bird Species	Spring	Summer	Fall	Winter
<b>Coastal Birds</b>				
Brown pelican	u	c	u	-
Great cormorant	r	-	r	r
Double-crested cormorant	a	c	a	c
*Laughing gull	a	a	a	r
Greater black-backed gull	c	c	c	c
Common black-headed gull	r	-	r	-
Ring-billed gull	a	c	a	a
*Common tern	c	c	c	o
Royal tern	c	c	c	r
*Foster's tern	c	c	c	r
Caspian tern	o	u	c	-
Gull-billed tern	u	u	o	-
*Least tern	c	c	-	-
<b>Shorebirds</b>				
Semipalmated plover	a	a	c	-
*Piping plover	u	u	u	-
*American oystercatcher	c	c	c	c
*Willet	c	c	u	r
Spotted sandpiper	u	u	u	r
Marbled godwit	r	u	o	-
Sanderling	a	a	c	c
Semipalmated sandpiper	a	a	c	-
Western sandpiper	r	c	c	o
Least sandpiper	a	c	c	o
Dunlin	a	o	a	a
<b>Wading and Marsh Birds</b>				
American bittern	o	o	o	o
Great blue heron	c	u	c	c
Great egret	c	a	c	u
Little blue heron	c	c	c	o
Tricolored heron	u	c	c	r
Black-crowned night heron	u	c	u	u
Yellow-crowned night heron	o	u	o	-
<b>Waterfowl</b>				
Tundra swan	c	-	c	c
*Mute swan	c	c	c	c
Greater snow goose	c	r	a	a
Brant	c	r	c	c
*Canada goose	c	c	c	c
*Wood duck	u	u	u	r
Pied-billed grebe	c	u	c	c
Horned grebe	c	-	c	c
Canvasback	r	-	r	r
Greater scaup	u	-	u	u
Lesser scaup	u	-	u	u
Common eider	-	-	r	r
Oldsquaw	u	-	u	u
Red-breasted merganser	c	r	c	c

Source: Modified from USFWS 1997.

Notes:

a – abundant

c – common

u – uncommon

o – occasional

r – rare

\* Birds known to nest on or near the refuge

*Italics = threatened/endangered species*

Various species of waterfowl throughout occur throughout the national seashore, including surf scooters, black scooters, black ducks, buffleheads, Canada geese, and brant. Waterfowl tend to utilize the seashore waters from October through March. Consistent with national trends, the number of waterfowl species has significantly declined at Assateague Island National Seashore over the past several years. On-site surveys generalizing temporal and spatial distribution of waterfowl at the national seashore have been used in this analysis. These surveys found that on the oceanside most waterfowl species occurred in the areas surrounding the Virginia visitor center in the southern section of the island and the Maryland visitor center in the northern section of the island. On the bayside waterfowl seemed to be concentrated just south of the Assateague State Park. Black duck, Canada goose, and surf scooter were the dominant species found in the northern sections of the park, which includes the northern PWC landing area. Black duck, bufflehead, black scooter, surf scooter, Canada goose, and brant are the dominant species found in the Tom's Cove area in the southern section of the park (Virginia Polytechnic Institute 1992), which includes the southern PWC landing area.

Ground-nesting species on Assateague Island include the least tern, American oystercatcher, Canada goose, and common tern. Nesting sites associated with these species have been identified in the northern section of the seashore near the Ocean City Inlet along the constructed berm, along the dunes, and along marsh edges (NPS 2000c). Bird species likely to occur in the immediate vicinity of the northern PWC landing area (Ocean City Inlet) include shorebird species such as plovers, sandpipers, and the American oystercatcher, along with several species of gulls. NPS staff report that shorebirds have not used the northern landing area beach since 1995, when a natural dune field filled in the periphery of the beach. If a significant storm or tide event reduced the dune field, the inlet landing beach could be re-occupied by breeding shorebirds and would be closed to all public access during the summer breeding season. With current closures, the only real issue remaining is the potential effects to nesting and foraging piping plovers on the beaches along the Ocean City Inlet, where PWC users are allowed to land. This involves 1/10 of a mile of shoreline.

Extensive marsh habitat occurs in the vicinity of the southern landing area (Little Beach). Birds likely to occur in the Little Beach area include species of wading and marsh birds such as egrets and heron, in addition to waterfowl species that utilize the calmer water habitats occurring in the backbay areas. The marshes and pools in the area are fished heavily by ospreys that typically nest on hunting blinds over open water in Assateague Channel and Chincoteague Bay (USFWS n.d.).

Red-tailed hawks nest in forests on the refuge. Large numbers of hawks stop to rest and feed during their fall migration, including kestrels, merlins, sharp-shinned, and Cooper's hawks. Three species of owls are year-round refuge residents. The eastern screech owl, a tree cavity nester, is occasionally found in wood duck or Delmarva Peninsula fox squirrel nest boxes. Common barn owls often nest in hunting blinds in adjacent marshes. These owls usually eat small rodents and birds, while the larger forest-dwelling great horned owl preys on an occasional rabbit, gray squirrel, and Delmarva Peninsula fox squirrel (USFWS n.d.).

## **FISHERIES**

While the fish population within the coastal bays of Maryland has changed, there is no sign of decline in the environmental quality of the waters. Some of the most common species within the coastal bays include black drum, red drum, bluefish, winter flounder, summer flounder, menhaden, spot, Atlantic croaker, weakfish, mullet, and spotted sea trout (USFWS 1993). Additional species documented at the southern end of the national seashore include those species listed above as well as butterfish, king whiting, American shad, Spanish mackerel, tautog, and weak fish.

One noticeable trend has been the decline in abundance of recreational and commercial fish within various coastal bays. Although there are no comprehensive fisheries assessments for Maryland's coastal bays, some studies indicate that there has been a decline in species such as summer flounder, bluefish, Atlantic croaker, spot and American eel (Bohlen and Boynton n.d.).

The 1996 Magnuson-Steven Act requires cooperation among the National Marine Fisheries Service (NMFS), fishing participants, and federal and state agencies to protect, conserve, and enhance essential fish habitats. Essential fish habitat is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 USC 1802(10)). Essential fish habitat occurs for several fish species in Sinepuxent and Chincoteague Bays, and in the vicinity of the northern and southern PWC landing zones. Essential fish habitat for various life stages of several fish species including red hake, winter flounder, witch flounder, windowpane flounder, Atlantic sea herring, bluefish, Atlantic butterfish, summer flounder, scup, black sea bass, whiting, king mackerel, Spanish mackerel, cobia, sand tiger shark, dusky shark, and sandbar shark occur in the vicinity of the Assateague Island National Seashore.

## **SHELLFISH**

Shellfish harvesting in Maryland's coastal bays has declined over the past decades due to over-harvesting, disease, and predation. The clam population decrease due to overharvesting in the 1960s and 1970s. Clamming is considered more favorable on the north end of the island. The crab population within the coastal bays of Maryland is at a level of concern, and state officials are considering modifying current management practices. At the southern end of the island, the recommended areas for crabbing are Swans Cove, in Assateague Channel by the bridge, or Tom's Cove.

Species of shellfish commonly found at Assateague Island include the northern quahog, found just below the surface of the sand in Tom's Cove, and the eastern oyster, also found in Tom's Cove. The Atlantic bay scallop has been found on Assateague beach and lives in shallow waters, usually where eelgrass is present. Scallops require vertical structures, such as seagrasses, for settlement, to avoid predators and suffocation due to silt. The bay scallop was thought to have disappeared from Chincoteague Bay approximately 60 years ago, following the near extinction of eelgrass in the region due to disease. Although eelgrass has since recolonized a substantial portion of Chincoteague Bay, the Atlantic bay scallop populations did not recover as quickly. In 1996 the MDNR shellfish monitoring program investigated restoring the Atlantic bay scallop in Chincoteague Bay, and in October 1997, 533,000 seed bay scallops were transplanted to Chincoteague Bay. In the summer of 2000 the Maryland Department of Natural Resources and the Virginia Institute of Marine Science discovered "wild" bay scallops in Chincoteague Bay, marking the return of this ecologically and economically important species to Chincoteague Bay (US EPA 1999).

Virginia oysters are grown commercially on leased beds below the low tide mark in Tom's Cove and along Assateague Channel. A few wild oysters may be found along the low marsh edge and the banks of Tom's Cove (USFWS 1993).

Blue crabs are also abundant in cove and bay waters adjacent to the refuge at the southern end of the island. Crabs are also found in Swan Pool, where crabbing is a popular activity of summer visitors. Horseshoe crabs are abundant in adjacent ocean waters. In late spring they lay eggs in Tom's Cove, providing a crucial food source for long-distance migrant shorebirds. Horseshoe crab availability makes Tom's Cove second only to Delaware Bay as a popular feeding area for ruddy turnstones, red knots, dunlin, semipalmated sandpipers, and sanderlings (The Assateague Naturalist 2000).

Because shellfish are highly susceptible to pollutants from untreated sewage (fecal coliform bacteria) and stormwater runoff, Maryland has implemented a water quality sampling program to monitor contamination levels within the coastal bays. To protect human health, all shellfish harvesting areas are monitored by the Maryland Department of the Environment. Harvesting areas that do not meet state water quality standards are closed to shellfish harvesting. Safety zones, from which no shellfish may be taken, are established around possible pollution source areas such as marinas, wastewater treatment plants and wastewater pumping stations. Shellfish closures have been initiated as precautions to prevent adverse health effects in humans in Sinepuxent Bay (Bohlen and Boynton n.d.).

## **THREATENED OR ENDANGERED WILDLIFE SPECIES**

### **WILDLIFE SPECIES**

Federally listed species known to occur on Assateague Island include the threatened piping plover, bald eagle, loggerhead sea turtle, and the endangered Delmarva fox squirrel. Threatened and endangered wildlife species documented by Virginia include the endangered Delmarva fox squirrel and the threatened loggerhead sea turtle, bald eagle, piping plover, peregrine falcon, and gull-billed tern. Species listed by Maryland and present near the northern PWC landing area include the endangered piping plover, royal tern, white tiger beetle, and little white tiger beetle and the state threatened black skimmer, and least tern (see appendix B).

As of 2000, approximately 60 pairs of breeding piping plover existed on the Maryland section of Assateague Island. The population has remained stable since 1996. Nesting activity has been documented during the spring seasons in the northern section of the island and in the off-road vehicle zone. Visitor disturbance of piping plover is controlled by park staff through signed closures around most of the north end of the island from mid-April through late August. Pets are prohibited year round from the north end of the island (NPS 2000c).

The bald eagle is documented to nest in the Chincoteague National Wildlife Refuge. Two active nests are located in the refuge (K. Mayne, USFWS, letter, Sept. 25, 2001).

A loggerhead crawl and nest were documented on the north end of the island, just south of the Ocean City Inlet on July 8, 1999. The loggerhead nest (containing 118 eggs) was moved inland to avoid inundation by high tides. Prior to this documentation, no other loggerhead nests had been confirmed on Assateague Island (NPS 1999a).

The Delmarva fox squirrel was translocated to Chincoteague National Wildlife Refuge in the early 1970s as part of the recovery plan. The squirrel currently inhabits loblolly pine forests in the refuge as well as the Virginia section of Assateague Island National Seashore (USFWS 1993).

In 2000 an estimated 213 breeding pairs of the least tern and 671 nests were documented between the northern end of the island and the off-road vehicle zone. In the off-road vehicle zone (see Parkwide map), 59 nests were documented between dune crossings seven and nine (NPS 2000c).

The tiger beetle is documented to occur on Assateague Island National Seashore along the ocean and bayside beaches in the north end of Assateague Island, where it is most abundant. Lesser numbers of the beetle have also been found in the off-road vehicle zone on Assateague Island (McCann, MDNR, pers. comm. 2001).



## **PLANT SPECIES**

The federally threatened and Maryland state endangered seabeach amaranth, considered extirpated from Maryland since 1977, has been recently documented on the north end of the island and within the off-road vehicle zone. Additional Maryland endangered plant species that have been documented in the vicinity of the northern landing area include the endangered silvery aster, fascicled gerardia, sea-beach sedge, wrinkled joint grass, stiff tick-trefoil, white spikerush, broad-leaved beardgrass, hairy ludwigia, wiry witch grass, marsh fleabane, and beach plum. The following species have apparently been extirpated from this area: sea ox-eye, blue-hearts, sea-beach sandwort, and chaffseed. Maryland threatened plant species in the vicinity of the northern landing area include Walter's paspalum, awned mountain-mint, and Torrey's beakrush (see appendix B).

A program to restore seabeach amaranth began on Assateague Island National Seashore in Maryland in 2000. Twelve restoration sites were selected to serve as planting locations in 2000–2002. Locations near the central and southern sections of the Maryland section of the island were chosen to maximize plantings in the areas that had retained the most impacts from past beach stabilization and to test the hypothesis that the areas are suitable for future restoration efforts (Lea and King 2001).

## **VEGETATION**

### **SHORELINE VEGETATION / WETLAND HABITATS**

Characterization of shoreline vegetation on and in the vicinity of the two PWC landing areas is based on the “Vegetation Classification of Assateague Island National Seashore” by the Nature Conservancy (1995) and subsequent surveys conducted to characterize vegetation on Assateague Island (Lea 1998; Lea 2000; Lea et al. 2000). The occurrence of wetland habitats on or in the immediate vicinity of the PWC landing areas is based on a review of National Wetland Inventory (NWI) data, as well as the vegetation classification and associated GIS data (see Wetlands map).

The shoreline associated with the northern PWC landing area is characterized by a naturally occurring unvegetated area. The unvegetated beach is bordered inland to the southeast by a dune grassland community dominated by American beachgrass, seaside goldenrod, and coastal panicgrass. The dune grassland community, designated as American beachgrass/beachgrass herbaceous vegetation, occurs almost exclusively on sandy, unstable, droughty substrates with no soil profile. Sand substrate in this community is usually visible, and litter accumulation from plant debris is nearly absent. The community generally occurs on foredunes that receive the force of winds and salt spray, but that are beyond the influence of most storm tides. The dune grassland community also occurs in an isolated area bordering the unvegetated beach in the central section of the northern PWC landing area. The unvegetated beach in the vicinity of the northern PWC landing area is bordered to the south predominantly by a maritime scrubland community characterized by bayberry and wax myrtle in the shrub layer and seaside goldenrod, American beachgrass, and buttonweed in the herbaceous layer.

The maritime scrubland community, designated as bayberry/buttonweed scrubland, typically occurs in the intermediate zone between the very unstable foredunes and the more protected back dunes. The community occurs in sands with no soil profile development. Storm surges and overwash frequently kill back the shrubs in the scrubland, and large unvegetated areas may occur in the community. More densely vegetated areas in the community occur in areas that have remained relatively undisturbed by storm surges or overwash for longer periods of time (TNC 1995).

Based on a review of National Wetlands Inventory data, the northern PWC landing area is an estuarine intertidal beach/bar habitat that is irregularly flooded. No vegetated wetland habitats occur on, or in the immediate vicinity of, the northern PWC landing area. Estuarine emergent, irregularly flooded, wetlands occur to the south of the PWC area in the Sinepuxent Bay along the shoreline within the boundaries of Assateague Island National Seashore. These wetlands are characterized by a high salt marsh community dominated by salt meadow hay and salt grass.

The northern three quarters of the southern PWC landing area at Little Beach is characterized by low salt marsh dominated by saltwater cordgrass. The habitat, which is generally restricted to the zone between mean sea level and the mean high water level, is designated as saltwater cordgrass herbaceous vegetation. On Assateague Island this community is characterized by near monotypic stands of saltwater cordgrass in areas closest to tidal influence, including areas in the southern landing area. Two small areas on, or closely adjacent to, the shoreline in the central section of the southern PWC landing area are characterized by salt panne vegetation dominated by glasswort, pickleweed, perennial glasswort, and/or saltwater cordgrass. This community, which typically occurs within the low salt marsh saltwater cordgrass community, is designated as saltwort-saltwater cordgrass herbaceous vegetation. An area of sparse shrubland habitat designated as bayberry/little bluestem-hyssop-leaved eupatorium sparse shrubland is located along the central section of the shoreline near Little Beach. Vegetation in this habitat, which occurs on well-drained sands, is highly variable but typically includes bayberry in the short shrub stratum and hyssopleaf and roundleaf thoroughwort, seacoast bluestem, poison ivy, and seaside goldenrod in the herbaceous layer (TNC 1995).

The south quarter of the southern PWC landing area is characterized by naturally occurring unvegetated areas, maritime/coastal loblolly pine wetland forest, grass shrubland, and a few small areas of dune grassland. Naturally unvegetated beaches occur along the northern half and southern tip on the south quarter of the southern PWC landing area. The remainder of the shoreline in the area is characterized by loblolly pine wetland forest that occurs in backdune depressions. The habitat is characterized by a closed to partially open canopy dominated by loblolly pine in the tree canopy, wax myrtle in the shrub layer, pinkweed in the herbaceous layer, and greenbriar and poison ivy in the vine layer. Two small dune grassland communities also border the unvegetated beach area on the northern half of the southern quarter. The dune grassland habitat, designated as American beachgrass/ beachgrass herbaceous vegetation, is described above under habitats that occur in the vicinity of the northern PWC landing area (TNC 1995).

Vegetated wetland habitats occur along the shoreline over a large area of the southern PWC landing area. The northern three quarters of the shoreline is dominated by an estuarine intertidal emergent persistent habitat characterized by low salt marsh dominated by saltwater cordgrass. The shoreline to the south of the low salt marsh community is characterized by a palustrine forested needle-leaved evergreen temporarily flooded tidal habitat, described above (TNC 1995).

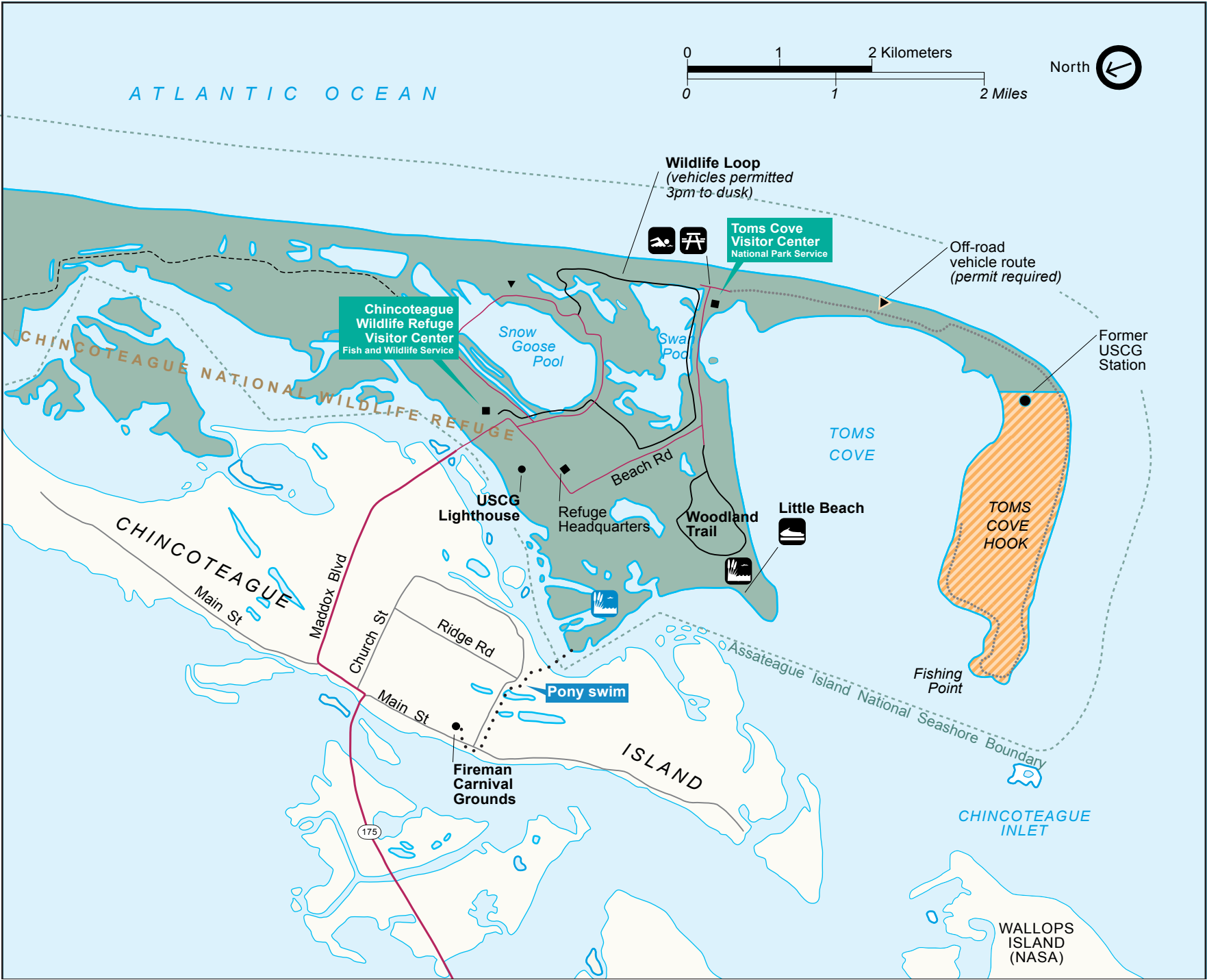
## **SUBMERGED AQUATIC VEGETATION**

Submerged aquatic vegetation (SAV) is a diverse assembly of rooted macrophytes that grow in shallow water, under the surface, but not above it. Under federal regulations SAV beds are considered special aquatic sites (40 CFR 230). These plants are beneficial to aquatic ecosystems because they provide a protective habitat for young and adult fish and shellfish, as well as food for waterfowl, fish, and mammals. They also aid in oxygen production, absorb wave energy and nutrients, and improve the clarity of the water. In addition, SAV beds stabilize bottom sediments and suspended sediments present in the water.

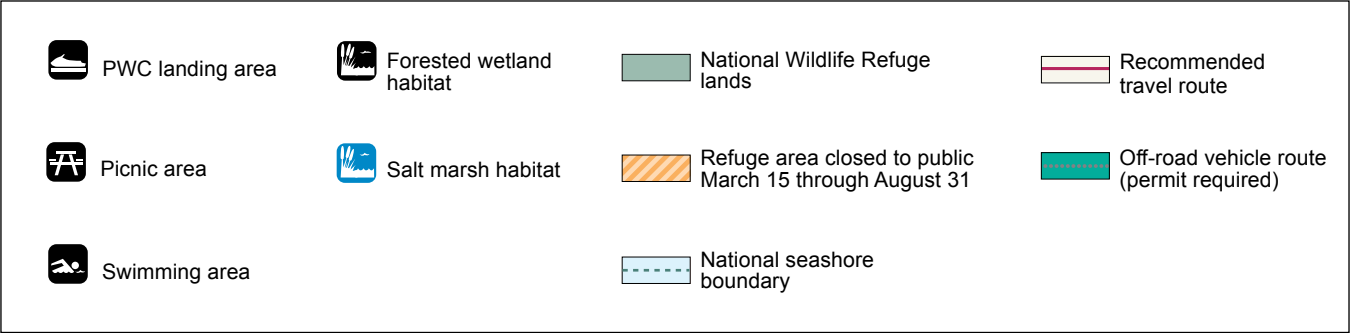
# Assateague Island National Seashore

Maryland / Virginia

## Wetlands



United States Department of the Interior / National Park Service WASO/April '02/622-20023

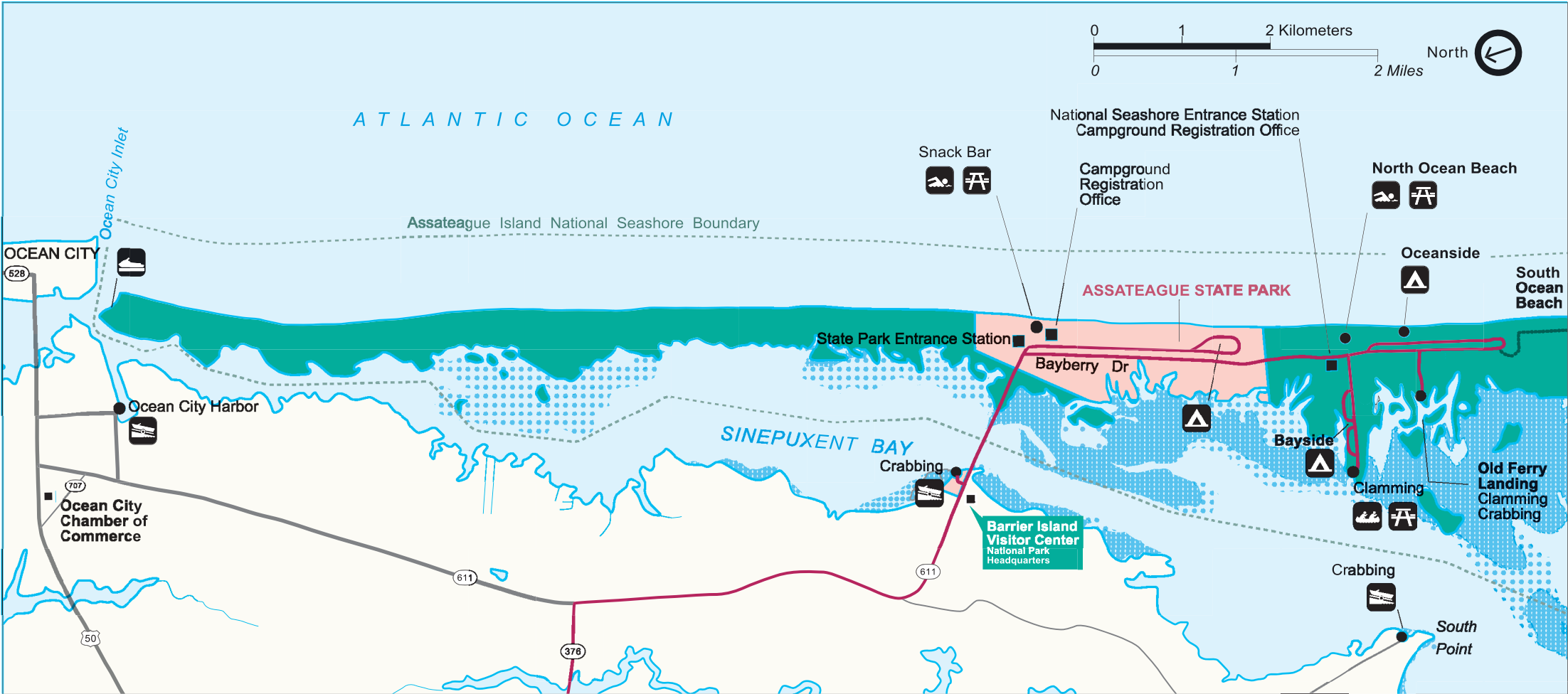




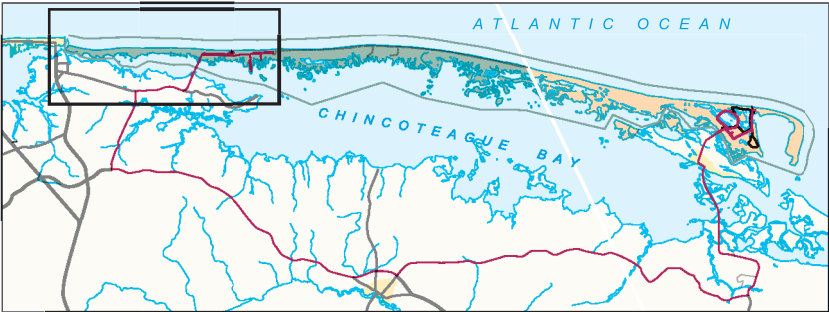
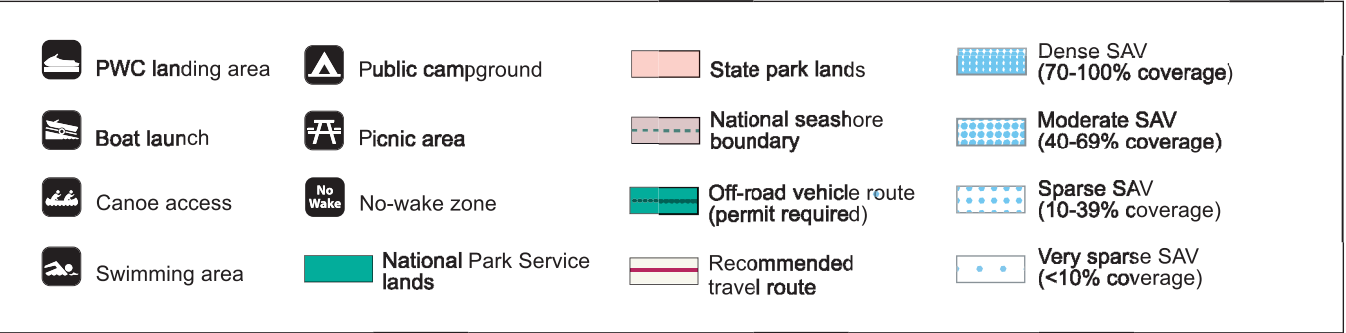
# Assateague Island National Seashore

Maryland / Virginia

## Submerged Aquatic Vegetation



United States Department of the Interior / National Park Service WASO/April '02/622-20022





Recent recognition of SAV loss as a result of commercial clam dredging in the Sinepuxent and Chincoteague Bays has resulted in cooperative efforts between the National Park Service, Maryland, and the Virginia Institute of Marine Science to protect submerged aquatic vegetation. The *Annotated Code of Maryland* (sec. 4-1006.1) requires the protection of SAV beds that have been delineated by the state from commercial dredging. Over 15,000 acres of submerged aquatic vegetation, mostly in the Chincoteague Bay and within the national seashore boundary, have been closed to commercial clam dredging since 1998. The SAV sanctuary includes both vegetated areas and adjacent non-vegetated areas to allow for habitat expansion. Buoys marking the boundary of SAV beds have been placed along the Assateague Island National Seashore. SAV beds extend outside the western national seashore boundary at several locations. PWC use is currently allowed in Sinepuxent Bay towards the northern end of the island between the SAV buoy line and the western boundary of the seashore (see Submerged Aquatic Vegetation Coverage map).

The Virginia Institute of Marine Science has conducted surveys of SAV beds in the Sinepuxent and Chincoteague Bays since 1987 as part of an effort to monitor SAV distribution in the Chesapeake Bay and tributaries and the coastal bays. Survey results indicate that SAV beds have increased in both Sinepuxent and Chincoteague Bays since 1987. Data collected in 1999 showed a 35% increase in coverage in Sinepuxent Bay over 1998 and a 14% increase in the Chincoteague Bay for the same period. In 1999 SAV beds covered approximately 643 hectares (1,590 acres) in Sinepuxent Bay and 6,193 hectares (15,300 acres) in Chincoteague Bay. SAV beds in Sinepuxent and Chincoteague are dominated by eelgrass and widgeon grass (VIMS 2001).

Based on the VIMS surveys, no SAV beds occur in the immediate vicinity of the northern or the southern PWC landing areas. SAV beds occur at numerous locations along the western shore of Assateague Island and in a large area encompassing the northern end of Chincoteague Island. SAV beds extend outside Assateague Island National Seashore at several locations along its western boundary (see Submerged Aquatic Vegetation Coverage map).

## VISITOR USE AND EXPERIENCE

Assateague Island National Seashore has between 1.8 and 1.9 million visitors per year, with approximately 1 million of those visitors counted in the south end of the seashore. The National Park Service estimates annual visitation from vehicle traffic counts, assuming 2.9 people per vehicle; there are no comparable annual counts of visitors accessing the park by boat or personal watercraft. Weekend visitation is typically heaviest. The majority of visitors come from Maryland, Virginia, Delaware, and Pennsylvania. Weekend visitation is heavy from the Washington/Baltimore metropolitan area. Data show an average decline of 1% per year in annual visitation over the past five years (see Table 9); however, park staff disagree that there has been a decline, citing faulty equipment as the reason for reduced counts, rather than a reduction in visitation.

**TABLE 9: ASSATEAGUE ISLAND NATIONAL SEASHORE VISITS**

Year	Visits (Automobile)
2001 (through 7/2001)	1,051,662
2000	1,814,101
1999	1,895,592
1998	1,840,384
1997	1,895,642
1996	1,914,050

Source: NPS 2001b.

## VISITOR ACTIVITIES

Assateague Island National Seashore offers a variety of outdoor recreational activities. As stated previously, activities on the island include swimming, camping, hiking, canoeing, bicycling, fishing, and off-road vehicle use. Many visitors come to the island to see the numerous animal and bird species, including the famous wild horses.

On the north end of the island, several types of recreation boats and fishing boats use the Ocean City Inlet to cross from the Atlantic Ocean to the Sinepuxent Bay. Many of the waterways are congested, especially at the Ocean City Inlet and Route 50 Bridge, as documented in *The Comprehensive Conservation and Management Plan for Maryland's Coastal Bays* (MDNR 1999). Within Assateague Island National Seashore, boaters typically anchor off the northwest corner of the island in an area protected from the currents and traffic of the inlet. Seventy-five percent of the recreational boating (typically fishermen) that occurs within the park boundary is localized within Sinepuxent Bay (C. Zimmerman, NPS, pers. comm., Oct. 17, 2001).

## VISITOR SATISFACTION

According to a visitor survey in 2000, approximately 96% of overall national seashore visitors (out of 93 respondents) were satisfied with facilities, services, and recreational opportunities (NPS 2000a). In terms of recreational opportunities, approximately 97% of the visitors (out of 82 respondents) were satisfied with their experience. Recreational opportunities in this survey focused on learning about nature, history, or culture; outdoor recreation; and sightseeing.

According to NPS observations, PWC operation in a hazardous manner is usually associated with privately owned rather than rented craft. The primary areas for these observations were the bay and ocean nearshore waters along the northern six miles of the island. In addition, the observations were conducted on a chance basis, and no attempts to quantify PWC violations or activities were made (NPS 1998a). Families have complained that PWC use conflicts with swimming, surf fishing, and other activities. A major goal at Assateague Island National Seashore is to provide users with an isolated experience typical of a barrier island, and PWC use near the shoreline makes this difficult. A survey conducted in the park revealed that many visitors are concerned with noise, safety, and disturbance to fishing areas. Staff have received 205 letters, e-mails, and comments documenting visitor concerns relating to PWC use at the park as part of the public involvement process associated with this environmental assessment. Among the documented comments, 143 support and 58 letters oppose a ban on PWC use at Assateague Island National Seashore.

In addition, recent surveys of recreational boaters operating in the waters within and adjacent to Assateague Island National Seashore report a high frequency of conflicts between the boating public using traditional watercraft and PWC users (University of Delaware 2000).

## PWC USE

The Maryland Department of Natural Resource and the University of Delaware conducted aerial boat surveys, mail surveys, and interviews during August 1999. Field surveys (193 interviews conducted by Maryland Department of Natural Resources at several launching sites in the area) show that 54% of boaters use the Ocean City Inlet during the weekend and weekdays, and 39% mostly on weekends. Mail surveys (78 returns) show 48% of the respondents boat on weekends and weekdays, and 12% on weekends. Of the interviewed boaters, 65% were Maryland residents, 24% were Pennsylvania



residents, and 11% were from Delaware, Virginia, New Jersey, and DC. PWC counts conducted by park staff during July 4, 2001, weekend to determine the level of PWC within the park boundary were somewhat less than those determined through the aerial surveys conducted by the Maryland Department of Natural Resources; counts were not conducted on the south end of the island (see Table 10).

**TABLE 10: ASSATEAGUE ISLAND BOATING USE (HOURLY AVERAGE)**

	All Boats (excluding PWC)	Personal Watercraft
Ocean City Inlet	48	8
Sinepuxent Bay	10	5
Little Beach - Chincoteague	3	2

Source: University of Delaware 2001; NPS 2001d.

Most PWC users come from the Ocean City area on the north end of the seashore, where PWC use is heaviest, including in the ocean waters in the northernmost mile of Assateague Island. PWC use is much less frequent on the southern end of the seashore. PWC use was not observed to be prevalent in the waters off Chincoteague National Wildlife Refuge, except for some use in Tom's Cove (C. Zimmerman, NPS, pers. comm., Sept. 2001).

In accordance with the Superintendent's Compendium, PWC use is restricted to landing only at the Ocean City Inlet on the north end of the island and Little Beach on the south end. PWC users may also traverse both Sinepuxent and Chincoteague Bays; however, they must remain west of the SAV closure buoys in Sinepuxent Bay and west of the seashore boundary in Chincoteague Bay.

Before the current restrictions in the Superintendent's Compendium became effective, the seashore staff convened a working group comprised of PWC livery operators, representatives of the Maryland Department of Natural Resources, and several other groups to discuss how PWC use should be managed. These groups were involved in determining the current PWC use areas. Following implementation of the current PWC use areas, some negative comments were received.

Prior to the current restrictions, PWC use was heavy in national seashore waters near the Ocean City Inlet, particularly near the south jetty and along Assateague's ocean waters (1998 observations). Private PWC operators prefer these waters due to the rougher, exciting ride and the fact that they are not heavily patrolled by enforcement agencies. Users on the north end were observed to spend most of their time jumping and riding waves (NPS 2001e).

In 2001 rental groups (with guides) were regularly observed operating outside the bay restriction boundary. A number of private PWC users have been observed in ocean waters farther from shore, but still within park jurisdiction, using the ebb shoal break rather than the shore break for jumping. Of the PWC users who did venture into park waters, most moved farther out to shore when they noticed NPS vehicles and staff approaching. A few PWC users continued to operate in the surf zone or to land in the presence of park staff (NPS 2001e).

There is no information about the use ratio between those visitors who own their craft as opposed to renting machines. The *Annotated Code of Maryland Regulation* requires livery operators to provide guides with PWC rentals. Guides do take PWC rental users on tours from Ocean City to Sinepuxent Bay. Fifteen liveries in Ocean City rent personal watercraft and one livery operator in Chincoteague. No personal watercraft are rented in the national seashore (J. Hofman, MDNR, pers. comm., Aug. 28, 2001). At the northern landing area and in Sinepuxent Bay, most rented personal watercraft are reportedly used for guided tours, while private owners typically ride on the north end, oceanside (J. Hofman, MDNR, pers. comm., August 28, 2001; Joe Emm, Island Water Sports, Inc., pers. comm., October 5, 2001; NPS). Inlet Sea-Doo and O.C. Rentals frequently conduct PWC tours to the bayside

of Assateague Island. Two other rental companies take tours to this area, but not as frequently. NPS observations indicate that the majority of the PWC use along the bayside of Assateague Island is associated with rental groups/tours, while there appears to be much more private PWC use on the oceanside (J. Hofman, MDNR, pers. comm., Aug. 28 and Oct. 9, 2001; NPS 1998a).

### State Boating Requirements

In both Maryland and Virginia, all watercraft propelled by mechanical propulsion, including personal watercraft, are required to be titled and registered, with an assigned number to be displayed on each side of the forward half of the vessel. Registration in Maryland is valid through the following calendar year. In Virginia registrations last three years (MDNR 2001a; VADGIF 2000).

Within Assateague Island National Seashore, PWC users are required to comply with all federal boating laws and regulations. In addition to these requirements, the owner/operator is required to comply with additional regulations and/or laws specific to the state in which the vessel is registered or operated as outlined above. Both Maryland and Virginia have established their own laws and regulations (see Table 11).

**TABLE 11: STATE LAWS AND REGULATIONS**

Maryland	Virginia
<ul style="list-style-type: none"> <li>• A person must be at least 16 years of age to operate a PWC.</li> <li>• A PWC may not be operated between sunset and sunrise.</li> <li>• All persons on board a PWC must wear a United States Coast Guard approved type I, II, III, or V personal flotation device (PFD).</li> <li>• All PWC must be equipped with a self-circulating device or a lanyard cut-off switch, which must be attached to the operator, the operator's clothing, or PFD. Self-circulating devices and cut-off switches may not be altered and must be functioning</li> <li>• A PWC may not be used to tow a person on water skis, aquaplanes, or other similar devices unless (a) the PWC has the capacity to carry three persons (including the driver, a rear-facing observer, and the skier), and (b) the PWC is specifically designed for skiing by the manufacturer.</li> <li>• On state waters a PWC may not be operated faster than 6 knots within 100 feet of any shore, wharf, pier, bridge abutment, or persons in the water</li> <li>• On Maryland waters in the Atlantic Ocean, a PWC may not be operated within 300 feet of persons in the water or surf fisherman.</li> <li>• A PWC may not be operated faster than 6 knots within 100 feet of another vessel except in a crossing or overtaking situation, as described in the "Federal Rules on the Road."</li> <li>• A PWC may not be operated in a negligent manner.</li> <li>• All PWC registered in Maryland must display, in clear view of the operator, a regulations sticker that explains the PWC regulations.</li> </ul>	<ul style="list-style-type: none"> <li>• A PWC operator must be at least 16 years of age, except any person 14 or 15 may operate a personal watercraft if they have successfully completed an approved boating safety education course, carry proof of successful completion of such course, and show this proof upon request by a law enforcement officer.</li> <li>• No person shall operate a PWC after sunset or before sunrise.</li> <li>• It is unlawful to operate a PWC unless the operator and each rider is wearing a type I, II, III, or V United States Coast Guard approved PFD.</li> <li>• The operator must attach a lanyard to himself/herself, clothing, or PFD, if the PWC is equipped with a lanyard-type engine cut-off switch.</li> <li>• No person may operate a PWC while carrying passengers in excess of the number for which the craft was designed by the manufacturer.</li> <li>• A PWC may not be operated faster than a "no-wake" speed when within 50 feet or less of docks, piers, boathouses, boat ramps, people in the water, and vessels other than PWC.</li> <li>• A PWC may not be operated recklessly or at a speed or in such a manner to endanger the life, limb or property of any person, including (a) weaving through vessels that are underway, stopped, moored, or at anchor while exceeding a reasonable speed under the circumstances and traffic conditions existing at the time; (b) following another vessel or person on water skis or similar device, crossing the path of another vessel, or jumping the wake of another vessel more closely than is reasonable and prudent, having due regard to speed of both vessels and the traffic on and the conditions of the water at that time; (c) crossing between the towing vessel and a person on water skis or other device; or (d) steering toward an object or person and turning sharply in close proximity to such object or person in order to spray or attempt to spray the object or person with the wash or jet spray of the PWC.</li> </ul>

Source: MDNR 2001a; VADGIF 2000

The town of Ocean City maintains safe beaches by enforcing boating laws and regulations established by the Maryland Department of Natural Resources and the U.S. Coast Guard. The only regulations Ocean City has specific to PWC use are under the Beach Activity Regulatory Ordinance, which states that it is unlawful:

For any person to ride a wind surfboard or operate any watercraft from or adjoining or land upon any beach in the corporate limits of Ocean City, from Friday of Memorial Day weekend to September 30, or the boardwalk, during the period from May 1 to September 30, between the hours of 10:00 a.m. and 5:00 p.m., in each year, except as follows: (a) emergency beaching of distressed watercraft; (b) Ocean City Beach Patrol members operating surf rescue units; or (c) Participation in an organized tournament or event either sanctioned by or upon receipt of a "special events permit" from the Mayor or City Council.

For any persons to operate any motorboat, jet ski or other type of motorized water vessel from or adjoining or land on any beach in the corporate limits of Ocean City except for emergency beaching or by Ocean City Beach Patrol members operating surf rescue units, between the hours of 10:00 a.m. and 5:30 p.m. during the period from the Friday of Memorial Day weekend through the Sunday of Sunfest weekend in each year.

Enforcement in the Ocean City Inlet is somewhat more difficult due to the density of boat traffic in the inlet. The Maryland Department of Natural Resources, the U.S. Coast Guard, and the Coast Guard Auxiliary are all familiar with the restrictions. The Department of Natural Resources issues warnings to PWC users who violate the restrictions. The Coast Guard will warn violators but does not typically issue citations. The Coast Guard Auxiliary helps educate PWC users/violators about the restrictions and occasionally calls the Coast Guard to report violators.

Within the boundaries of Assateague Island National Seashore, the National Park Service has jurisdiction over the waters in the states of Maryland and Virginia. Based on concurrent jurisdiction agreements with both states, NPS park rangers enforce the regulations listed above (J. Burns, NPS, pers. comm., Oct. 18, 2001).

## **VISITOR SAFETY**

Personal watercraft comprise 9% of all registered "vessels" in the United States, but are involved in 36% of all boating accidents (NTSB 1998). In part, this is believed to be a boater education issue (i.e., inexperienced riders lose control of the craft), but it also is a function of how the craft are operated (i.e., no brakes or clutch; when drivers let up on the throttle to avoid a collision, steering becomes difficult). Recent surveys of recreational boaters operating in the waters within and adjacent to Assateague Island National Seashore report a high frequency of conflicts between the public using traditional watercraft and PWC users. Problems reported include the presence of PWC in fishing areas, noise, PWC operation too close to anchored boats, and excessive speed (University of Delaware, 2000). In addition, swimmers in several areas around the island have complained about personal safety issues related to the presence of PWC users (NPS 2001e).

Visitors to Assateague Island National Seashore are protected under the Maryland and Virginia state boating regulations. Specifically at the Ocean City Inlet landing area and the Sinepuxent Bay PWC use area, Maryland boating regulations require that PWC users may not go faster than 6 knots within 100 feet of any shore, wharf, pier, bridge abutment, or persons in the water; they may not operate within 300 feet of persons in the water or surf fisherman on the Atlantic Ocean; they may not operate faster than 6 knots within 100 feet of another vessel except in a crossing or overtaking situation; and they may not operate in a negligent manner. In addition, in an effort to increase safety as well as to protect

fragile underwater grasses, the Maryland Department of Natural Resources was scheduled to adopt new regulations for PWC use effective October 1, 2001. The regulations would prohibit PWC operation above idle speed in water less than 18 inches deep, and they would authorize the department to limit PWC use in waters with a depth of less than one meter. Therefore, national seashore visitors accessing the north end of the island for recreational purposes such as fishing, surfing, swimming, and sunbathing should not come in contact with PWC users outside the landing area, within 300 feet of the shoreline on the ocean, or within 100 feet of the shoreline on the bayside. Furthermore, Maryland boating regulations require PWC users to avoid boaters, therefore, boaters utilizing the northwest beach to anchor and access the island are protected if they are anchored within 100 feet of the shoreline. PWC users who abide by the regulations would bypass persons and other vessels in the water by 100 feet. Visitors to Little Beach would adhere to similar regulations as legislated by the state of Virginia. Specifically, PWC users should not operate faster than at “no-wake” speed when within 50 feet or less of docks, piers, boathouses, boat ramps, people in the water, and vessels other than personal watercraft; and they may not operate recklessly or at a speed or in such a manner to endanger the life, limb or property of any person (MDNR 2001a; VADGIF 1999).

The Maryland Department of Natural Resources requires PWC rental companies to sign a contract stating that they will follow all PWC laws. Renters are provided instructions on how to properly operate a personal watercraft and are required to take a multiple-choice test. In addition, rental companies in Ocean City are required to send a certified guide with the tour groups (J. Hoffman, MDNR, pers. comm., Aug. 28, 2001).

## ACCIDENTS AND INJURIES

Increased PWC use in recent years has resulted in more concern about the health and safety of operators, swimmers, snorkels, divers, and other boaters. A 1998 National Transportation Safety Board study revealed that although recreational boating fatalities have been declining in recent years, PWC related fatalities have increased (NTSB 1998). PWC accident statistics provided by the U.S. Coast Guard supports the increase in PWC related fatalities (see Table 12). In U.S. waters there were 5 PWC-related fatalities in 1987, increasing to 68 PWC-related fatalities in 2000. However, the peak occurred in 1997, with 84 PWC-related fatalities. Since 1997 PWC-related accidents, injuries, and fatalities have decreased. Following this same pattern, the percentage of all boats involved in accidents decreased from 36.3% in 1996 to 29.6% in 2000. The increases and decreases in PWC accidents, injuries, and fatalities are comparative to the number of PWC sales and number of PWC owned (M. Schmidt, USCG, pers. comm., Sept. 4, 2001).

The U.S. Coast Guard’s Office of Boating Safety studied exposure data to assess boating risks. This method allows for a comparison between boat types based on comparable time in the water. PWC use ranked second in boat type for fatalities per million hours of exposure in 1998, with a 0.24 death rate per million exposure hours.

**TABLE 12: PWC ESTIMATES AND ACCIDENT STATISTICS**

Year	Recreational Boats Owned*	PWC Owned*	No. of PWC in Accidents	No. of PWC Injuries	No. of PWC Fatalities	No. of All Boats Involved in Accidents	% PWC Involved in Accidents
1987	14,515,000	N/A	376	156	5	9,020	4.2
1988	15,093,000	N/A	650	254	20	8,981	7.2
1989	15,658,000	N/A	844	402	20	8,020	10.5
1990	15,987,000	N/A	1,162	532	28	8,591	13.5
1991	16,262,000	305,915	1,513	708	26	8,821	17.2
1992	16,262,000	372,283	1,650	730	34	8,206	20.1

Year	Recreational Boats Owned*	PWC Owned*	No. of PWC in Accidents	No. of PWC Injuries	No. of PWC Fatalities	No. of All Boats Involved in Accidents	% PWC Involved in Accidents
1993	16,212,000	454,545	2,236	915	35	8,689	25.7
1994	16,239,000	600,000	3,002	1,338	56	9,722	30.9
1995	15,375,000	760,000	3,986	1,617	68	11,534	34.6
1996	15,830,000	900,000	4,099	1,837	57	11,306	36.3
1997	16,230,000	1,000,000	4,070	1,812	84	11,399	35.7
1998	16,657,000	1,100,000	3,607	1,743	78	11,368	31.7
1999	16,773,000	1,096,000	3,374	1,614	66	11,190	30.2
2000	16,965,000	1,078,400	3,282	1,580	68	11,079	29.6
Totals			33,851	15,238	645		

Source: M. Schmidt, USCG, pers. comm., Sept. 4, 2001.

\* Estimates provided by the National Marine Manufacturers Association (B. Schmidt, USCG, pers. comm., Sept. 4, 2001).

In both Maryland and Virginia, an operator of a vessel is required to report an accident within 48 hours or within 24 hours if there is a loss of life, if a person involved in the accident receives medical treatment beyond first aid, if a person in the accident is disabled more than 24 hours, or if a person disappears. Accidents must be reported within 10 days if boat or property damage totals more than \$500 or an earlier report was not required but becomes necessary (MDNR 2001b; VADGIF 2000).

Although the NTSB study indicates PWC-related fatalities increasing in the United States, PWC-related fatalities in the Assateague Island National Seashore area have been few in recent years. There were 46 PWC-related accidents in Maryland in 2000, 17 of these accidents, including one fatality, occurred in Worcester County. The primary causes of these accidents were excessive speed, operator inexperience, operator inattention, and machinery failure. Five of the PWC-related accidents in Worcester County occurred in the Sinepuxent Bay (M. Schmidt, USCG, pers. comm., Sept. 4, 2001).

There were 37 PWC-related accidents resulting in one fatality in Virginia in 2000. Of these accidents, two occurred in Accomack County; neither was fatal. The causes of the accidents in Accomack County were due to operator inattention and careless/reckless operation. The two PWC-related accidents reported in the county occurred in the Assateague Channel (near the southern landing area, between Assateague Island and Chincoteague Island) and the Atlantic Ocean (M. Schmidt, USCG, pers. comm., Sept. 4, 2001). According to the Virginia Game and Inland Fisheries, Virginia has had nine PWC-related fatalities between 1996 and 2000, but only one fatality was reported between 1999 and 2000 (R. Rowe, pers. comm., Aug. 28, 2001, VADGIF).

No fatalities associated with PWC rentals in Ocean City occurred in 2000 and through August 28, 2001. The last fatality associated with PWC rentals in Ocean City occurred in 1999 (J. Hoffman, pers. comm., August 28, 2001, MDNR).

## SOCIOECONOMIC ENVIRONMENT

A detailed description of the socioeconomic environment affected by PWC use at Assateague Island National Seashore is provided in the report "Economic Analysis of Personal Watercraft Regulations in Assateague Island National Seashore" (Law Engineering and Environmental Sciences, Inc., et al. 2002).

The two largest communities near Assateague Island National Seashore are Ocean City, Maryland, and Chincoteague, Virginia. Both cities rely on tourism for their economic base. The population of Ocean City during the winter is approximately 8,000 and increases to over 300,000 during the summer. According to the Ocean City Chamber of Commerce, 8 million people visit the area annually, with 4 million visitors between Memorial Day and Labor Day. PWC use, especially in Assateague Island

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National Seashore, makes a relatively small contribution to tourist-related revenues in the regional economy. In addition, PWC account for less than 0.5% of total visitation to Assateague Island National Seashore. There are 15 PWC sales or rental shops in the vicinity of the seashore. One PWC sales shop and 13 PWC rental shops were identified in Ocean City, Maryland. In addition, one PWC rental shop was identified in Chincoteague, Virginia. NPS staff attempted to contact all 15 of these businesses during January 2002 and successfully collected interview data from two rental shops and one sales shop in Ocean City.

Interviews indicate that each rental shop only allows its customers to operate personal watercraft in a well-defined area near the rental shop. Because not all of the rental shops are located close to Assateague Island National Seashore, not all of the shops allow renters to access the seashore. Officials from the Maryland Department of Natural Resources stated that four rental shops in Ocean City take PWC renters into Assateague Island National Seashore (Cpt. Bloxom, MDNR, pers. com. Jan. 2002; J. Hoffman, MDNR, pers. com., Jan. 2002).

Interview data suggest that the rental shops near Assateague Island National Seashore have other sources of revenue aside from PWC rentals. These include parasailing, wildlife-viewing tours to the seashore, boat ramps (with a fee), storage for the winter, a service center, and sale accessories. In addition to businesses offering PWC sales and service, lodging establishments, restaurants, gas stations, and retail stores in the area could be affected by the proposed restrictions.

## **NATIONAL SEASHORE MANAGEMENT AND OPERATIONS**

Rangers at Assateague Island National Seashore enforce the state boating regulations referenced above to ensure visitor safety; however, available staff are limited. Funding has been requested for two additional full-time permanent employees to be used exclusively for PWC regulation enforcement. Currently, National Park Service has sufficient staff to allow for one person to patrol the 17,000 acres of surface water within their jurisdictional boundaries for approximately four to five hours, three to five days per week. Typically a ranger is available during the busier weekends during the summer season from Memorial Day to Labor Day. The Maryland Department of Natural Resources and the Virginia Marine Resources Commission provide assistance, usually in the form of education about PWC closure boundaries and enforcement of state regulations (J. Burns, NPS, pers. comm., Oct. 18, 2001).

# ENVIRONMENTAL CONSEQUENCES

## SUMMARY OF LAWS AND POLICIES

Three overarching environmental protection laws and policies guide the National Park Service — the National Environmental Policy Act (NEPA) of 1969, and its implementing regulations; the National Parks Omnibus Management Act of 1998 (NPOMA); and the National Park Service Organic Act.

- (1) The NEPA is implemented through regulations of the Council on Environmental Quality (40 CFR 1500–1508). The National Park Service has in turn adopted procedures to comply with NEPA and the CEQ regulations, as found in *Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision Making* (2001), and its accompanying handbook.
- (2) The National Parks Omnibus Management Act of 1998 (NPOMA) (16 USC 5901 et seq.) underscores the NEPA in that both are fundamental to National Park Service park management decisions. Both acts provide direction for articulating and connecting the ultimate resource management decision to the analysis of impacts, using appropriate technical and scientific information. Both also recognize that such data may not be readily available, and they provide options for resource impact analysis should this be the case.

The Omnibus Act directs the National Park Service to obtain scientific and technical information for analysis. The National Park Service handbook for *Director's Order #12* states that if “such information cannot be obtained due to excessive cost or technical impossibility, the proposed alternative for decision will be modified to eliminate the action causing the unknown or uncertain impact or other alternatives will be selected” (section 4.4).

Section 4.5 of *Director's Order #12* adds to this guidance by stating “when it is not possible to modify alternatives to eliminate an activity with unknown or uncertain potential impacts, and such information is essential to making a well-reasoned decision, the National Park Service will follow the provisions of the regulations of CEQ (40 CFR 1502.22).” In summary, the National Park Service must state in an environmental assessment or impact statement (1) whether such information is incomplete or unavailable; (2) the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific adverse impacts which is relevant to evaluating the reasonably foreseeable significant adverse impacts; and (4) an evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community.

- (3) The 1916 National Park Service Organic Act (16 USC 1) commits the Park Service to making informed decisions that perpetuate the conservation and protection of park resources unimpaired for the benefit and enjoyment of future generations.

## GENERAL METHODOLOGY FOR ESTABLISHING IMPACT THRESHOLDS AND MEASURING EFFECTS

While much has been observed and documented about the overall effects of personal watercraft on the environment, as well as public safety concerns, the site-specific impacts, or impacts on any particular

resource, under all conditions and scenarios are more difficult to measure and affirm with absolute confidence. Even with monitoring, data collected and interpreted since personal watercraft (PWC) were introduced in parks, and their effects on park resources relative to other uses and influences, are difficult to define and quantitatively measure.

Recognizing this dilemma, the interdisciplinary planning team created a process for impact assessment, based upon the directives of the *DO #12 Handbook* (section 4.5(g)). National park system units are directed to assess the extent of impacts to park resources as defined by the context, duration, and intensity of the effect. While measurement by quantitative means is useful, it is even more crucial for the public and decision-makers to understand the implications of those impacts in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists. With interpretation, one can ascertain whether a certain impact intensity to a park resource is “minor” compared to “major” and what criteria were used to draw that conclusion.

Therefore, issues and concerns, as presented in the “Purpose and Need for Action” were further defined and focused to assess the various PWC management alternatives given the context, duration, and intensity of effects on park resources. Thresholds were established for each impact topic to help understand the severity and magnitude of changes in resource conditions, both adverse and beneficial, of the various management alternatives.

Each alternative is compared to a baseline of existing conditions to determine the context, duration, and intensity of resource impacts. The baseline, for purposes of impact analysis, is the continuation of PWC use and current management projected over the next 10 years (alternative A). In the absence of quantitative data, best professional judgment was used. In general, the thresholds used come from existing literature on personal watercraft, federal and state standards, and consultation with subject matter experts and appropriate agencies.

In addition to establishing impact thresholds, the park’s resource management objectives and goals (as stated in chapter 1) were integrated into the impact analysis. In order to further define resource protection goals relative to PWC management, the park’s *Strategic Plan* was used to ascertain the “desired future condition” of resources over the long term. The impact analysis then considered whether each PWC management alternative contributes substantially to the park’s achievement of its resource goals, or would be an obstacle to achieving the resource goal as defined by the *Strategic Plan*. The planning team then considered potential ways to mitigate effects of personal watercraft on park resources, and modified the alternatives accordingly.

For the purposes of analysis, the following assumptions are used for all impact topics:

*Short-term impacts:* Those occurring from PWC use in the immediate future (per trip through a single season of use, usually 1 to 6 months).

*Long-term impacts:* Those occurring from PWC use over several seasons of use through the next 10 years.

*Direct impacts:* Those occurring from the direct use or influence of personal watercraft.

*Indirect impacts:* Those occurring from PWC use that have indirectly altered a resource or condition.

*Cumulative impacts:* Those occurring from continued PWC use at the park, when considered in context with other site-specific, local, or regional past, present, and reasonably foreseeable



actions/activities that could affect the same resources or conditions, both inside and outside park boundary.

*Study area:* Each resource impact is assessed in direct relationship to those resources affected both inside and outside the park, to the extent that the impacts can be substantially traced, linked, or connected to PWC use inside park boundary. Each impact topic, therefore, has a study area relative to the resource being assessed, and it is further defined in the impact methodology.

Unless otherwise noted in the analysis, impacts are considered to be adverse.

## IMPAIRMENT ANALYSIS

The National Park Service is prohibited from impairing park resources and values by the National Park Service Organic Act. The National Park Service *Management Policies 2001* (section 1.4.5) state “an impairment . . . is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values.” In addition, the *Management Policies* state “whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.”

The *Management Policies* also state, “an impact to any park resource or value may constitute an impairment . . . to the extent that it affects a resource or value whose conservation is . . . necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or identified as a goal in the park’s general management plan or other relevant National Park Service planning documents.”

The determination of impairment is closely tied to the outcome of the resource impact analysis. This determination is also made with a parallel consideration of the park’s legislative mandates (purpose and significance), and resource management objectives as defined in its general management plan or other relevant plans.

The following process was used to determine whether the various PWC management alternatives had the potential to impair park resources and values:

1. The park’s enabling legislation, *General Management Plan*, *Strategic Plan*, and other relevant background was reviewed to ascertain the park’s purpose and significance, resource values, and resource management goals or desired future conditions.
2. PWC management objectives specific to resource protection goals at the park were identified.
3. Thresholds were established for each resource of concern to determine the context, intensity and duration of impacts, as defined above.
4. An analysis was conducted to determine if the magnitude of impact reached the level of “impairment,” as defined by National Park Service *Management Policies*.

The impact analysis includes any findings of impairment to park resources and values for each of the management alternatives.

## PWC USE AND DISTRIBUTION

PWC use trends were identified to determine direct and indirect impacts of PWC management strategies on national seashore resources. Other visitor use trends were identified to help assess cumulative effects. PWC and visitor use trends were determined using data available from the park, discussions with staff, discussions with staff of Maryland and Virginia state agencies, and with personnel at the University of Delaware. Also, national trends, U.S. census data, and Assateague Island National Seashore visitor surveys were analyzed.

Although no annual counts are conducted of visitors accessing the park by boat or personal watercraft, the Maryland Department of Natural Resources and the University of Delaware conducted aerial boat surveys during the 1999 and 2000 seasons. In addition, the park conducted a PWC count during the July 4th weekend 2001. Based on the 1999–2000 aerial surveys, PWC use during the busy 6-hour period of weekend midday use (total within and outside park boundary), averaged eight per hour at the Ocean City inlet, five per hour within Sinepuxent Bay, and two per hour near Little Beach on the south end of the island. As would be expected, PWC use during the July 4, 2001, weekend was higher, averaging 27 at Sinepuxent Bay, 7 at the inlet, and 4 along the beach (counts were not conducted at the south end of the island.)

PWC use within Assateague Island National Seashore probably began at the same time that personal watercraft were introduced at nearby Ocean City, and NPS staff noted that PWC use has increased throughout the 1990s. Use is typically localized, occurring at the northern end of the island in and around the Ocean City Inlet, in the Sinepuxent Bay area, and at the southern end of the island near the area known as Little Beach. Park staff indicate that the heaviest usage and highest general visitation area for watercraft of any type is the northern tip of the island, which receives intensive use by beach goers, surfers, fisherman, and recreational boaters. NPS and the MDNR staff believe, based upon their observations, that the majority of the PWC use along the bayside of Assateague Island is associated with rental groups/tours. MDNR staff report that during operating hours in the peak summer season, 40 to 50 PWC per day will participate in tours to Assateague Island National Seashore from the Ocean City liveries (J. Hoffman, MDNR, pers. comm., Aug. 28, 2001). One firm, Island Water Sports, conducted tours before 1999 to the bayside of Assateague for 40 to 50 PWC users per day, but has discontinued the tours, citing congestion and user conflicts as the primary reason (J. Emm, Island Water Sports, Inc., pers. comm., 2001). At the south end of the island, where PWC use is less frequent, one company rents personal watercraft.

PWC ownership growth in the region is comparable to that on the national level. National PWC ownership increased every year between 1991 and 1998, with the rate of annual increase peaking in 1994 at 32%. National ownership actually dropped slightly in 1999 and 2000. Regional PWC ownership, reported from registration data provided by the Maryland Department of Natural Resources and the Virginia Department of Game and Inland Fisheries, shows a continual increase through 2000, although the rate of growth has slowed in recent years, similar to national trends.

To determine current and future PWC use projections, as well as for other boats, various sources of information were obtained, as cited above. No absolute number of PWC users could be established based on available information. Some of the official registrations do not include separate counts for PWC users, and in some cases, numbers obtained from a state agency contradict those from county agencies. In addition, Assateague boaters are visitors from various states. Consequently, the approach was to consider national trends (see Table 13), regional trends, and estimates from observations in recent years (after 1997). PWC registrations showed a peak between 1992 and 1996 but have declined over the last two years.

TABLE 13: NATIONAL PWC USE TREND

Year	No. of Boats Owned	No. of PWC Owned	Boat Ownership Trend (%)	PWC Ownership Trend (%)
1991	16,262,000	305,915	--	--
1992	16,262,000	372,283	0	21.7
1993	16,212,000	454,545	0	22.1
1994	16,239,000	600,000	0	32.0
1995	15,375,000	760,000	-5	26.7
1996	15,830,000	900,000	3	18.4
1997	16,230,000	1,000,000	3	11.1
1998	16,657,000	1,100,000	3	10.0
1999	16,773,000	1,096,000	1	-0.4
2000	16,965,000	1,078,400	1	-1.6

Source: NMMA.

Note: Based on percentage of PWC owners among total boat owners.

Regional information and surveys combined with the national trends helped provide a more accurate picture of the PWC use trends in the Assateague Island area. Accomack County, Virginia, provided information on PWC registration and population growth. Worcester County, Maryland, does not have PWC registration data. Consequently, percentages were extrapolated by making a comparison with Accomack County's population growth versus PWC registrations. The approach was to compare the 2% per year population increase and the 0.98% increase in PWC use in Accomack County, with the 2.9% increase in population in Worcester County. This method provided a 1.4% increase a year in PWC use in Worcester County (see Table 14). Based on the trends in population for Maryland, a conservative approach was used for projecting annual increases in PWC use, resulting in 1.5% regional growth.

TABLE 14: POPULATION GROWTH AND PWC USE TREND IN ACCOMACK COUNTY (VA) AND WORCESTER COUNTY (MD)

Year	Accomack County Population Increase (2%/yr)			Worcester County Population Increase (2.9%/yr) <sup>1</sup>	
	Population	PWC Registrations	Use Trends (Percentage Change)	Population	Extrapolated Use Trends (Percentage Change) <sup>2</sup>
1990	31,703			35,028	
1991	32,337			36,044	
1992	32,984			37,089	
1993	33,643			38,165	
1994	34,316			39,271	
1995	35,003			40,410	
1996	35,703			41,582	
1997	36,417	4,468		42,788	1.4
1998	37,145	4,476	0.18	44,029	1.4
1999	37,888	4,531	1.23	45,306	1.4
2000	38,646	4,478	-1.17	46,620	1.4
Avg.		4,511	0.74		1.4

Source: U.S. Census Bureau 2000, 2000a, 2001, 2001a; G. Bridewell, VADGIF, pers. comm., Oct. 12, 2001.

Assumptions: National PWC trends are negative. However, population trends in the counties are positive. Since 69% of users in Maryland are state residents (University of Delaware 2000), it is safe to assume that regional average trends will be closer to the Maryland trends. It was assumed that regional trends would correspond with state trends.

1. No PWC registration data exists for Worcester County. Percentages were extrapolated by making a comparison with Accomack County's population growth vs. PWC registration.

2. For a 2% yearly population increase (Accomack) = 0.98 PWC use increase (the trend for the last five years). For a 2.9% yearly population increase (Worcester) +  $2.9 \times 0.98/2 = 1.4\%$  PWC use increase. Therefore, the average for the region =  $1.4\% + 0.98/2 = 1.2\%$ .

## OTHER WATERCRAFT NUMBERS AND DISTRIBUTION

The surveys conducted by the state and NPS staff, together with the previously established PWC trend, helped establish current user levels and develop user trends for the next 10 years. Table 15 shows the baseline conditions (number of watercraft per hour) at all three areas and the number of personal watercraft compared to all other boats, as well as the calculated numbers based on an annual 1.5% increase.

**TABLE 15: ASSATEAGUE ISLAND BOATING USE AND TRENDS UNDER EXISTING CONDITIONS (per hour)**

Year	Ocean City Inlet		Sinepuxent Bay		Little Beach	
	All Boats*	PWC	All Boats*	PWC	All Boats*	PWC
2001	48.0	8.0	10.0	5.0	3.0	2.0
2002	48.7	8.1	10.2	5.1	3.0	2.0
2003	49.5	8.2	10.3	5.2	3.1	2.1
2004	50.2	8.4	10.5	5.2	3.1	2.1
2005	50.9	8.5	10.6	5.3	3.2	2.1
2006	51.7	8.6	10.8	5.4	3.2	2.2
2007	52.5	8.7	10.9	5.5	3.3	2.2
2008	53.3	8.9	11.1	5.5	3.3	2.2
2009	54.1	9.0	11.3	5.6	3.4	2.3
2010	54.9	9.1	11.4	5.7	3.4	2.3
2011	55.7	9.3	11.6	5.8	3.5	2.3
2012	56.5	9.4	11.8	5.9	3.5	2.4

Source: University of Delaware 2000, NPS 2001e.

\* Based on surveys of weekend, midday use.

Looking at the national and regional data, trends indicate that dramatic increases in ownership ended in 1996, followed by a decline through 1998, and now stabilizing within low percentages of increase. Therefore, it is assumed that PWC use at the national seashore will continue to increase in the future even though national trends indicate ownership is on the decline. As previously mentioned, although PWC counts have not been conducted at Assateague Island National Seashore, PWC use trend data in other parks around the nation indicate small annual increases (e.g., 2% a year at Pictured Rocks National Lakeshore). Therefore, the following analyses assume an annual increase in PWC use within Assateague Island National Seashore Park of 1.5% per year over the next 10 years. This accounts for the national decrease in ownership and the regional increase.

The types of boats and abundance at Assateague (Maryland side) are shown in Table 16 and include powerboats, personal watercraft, and sailboats.

**TABLE 16: BOAT TYPES AND ABUNDANCE ON THE MARYLAND SIDE OF ASSATEAGUE ISLAND**

Length (feet)	Percentage	Horsepower	Percentage	Boat Type	Percentage
Shorter than 16'	15	Less than 50	15	Powerboat	75
16'-25'	77	51-100	33	Pontoon	10
Longer than 25'	8	101-250	40	PWC	7
		More than 250	12	Other	6
				Sailboat	2

Source: University of Delaware 2000.

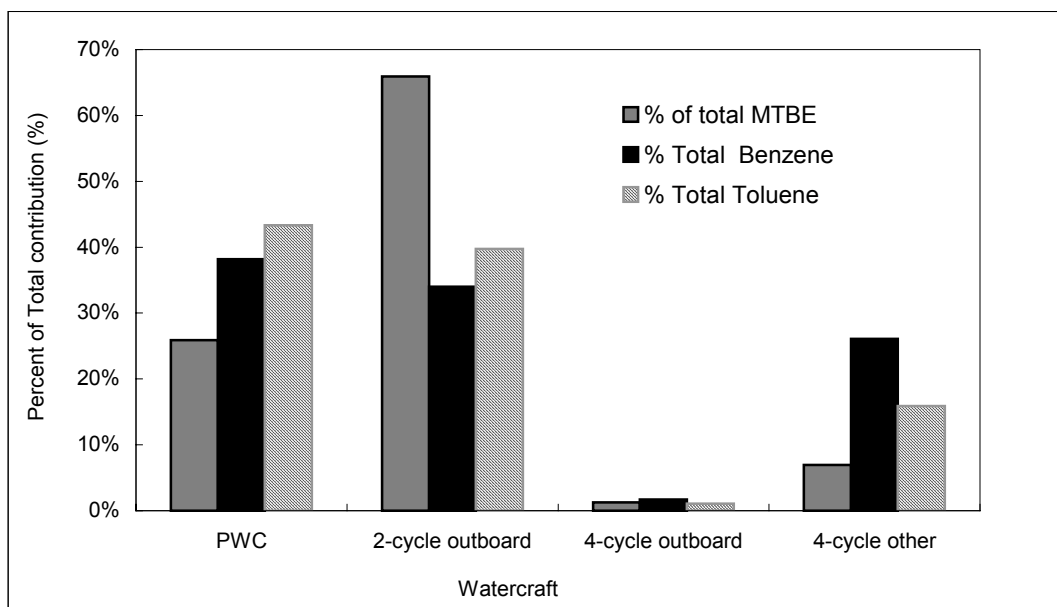
## WATER QUALITY

Most research on the effects of personal watercraft on water quality focuses on the impacts of two-stroke engines, and it is assumed that any impacts caused by these engines also apply to two-stroke

engines in personal watercraft. There is general agreement that two-stroke engines (and personal watercraft) discharge a gas-oil mixture into the water. Fuel used in PWC engines contains many hydrocarbons, including benzene, toluene, ethylbenzene, and xylene (collectively referred to as BTEX). Polycyclic aromatic hydrocarbons (PAHs) also are released from boat engines, including those in personal watercraft. These compounds are not found appreciably in the unburned fuel mixture, but rather are products of combustion. Discharges of all these compounds — BTEX and PAHs — have potential adverse effects on aquatic life and human health if present at high enough concentrations. A common gasoline additive, methyl tertiary butyl ether (MTBE) is also released with the unburned portion of the gasoline. The PWC industry suggests that although some unburned fuel does enter the water, the fuel's gaseous state allows it to evaporate readily (Sea-Doo 2000).

A typical conventional (i.e., carbureted) two-stroke PWC engine discharges as much as 30% of the unburned fuel mixture into the exhaust (California Air Resources Board 1999). At common fuel consumption rates, an average two-hour ride on a personal watercraft may discharge 3 gallons (11.34 liters) of fuel into the water (NPS, VanMouwerik and Hagemann, 1999). The Bluewater Network states that personal watercraft can discharge between 3 and 4 gallons of fuel over the same time period. However, the newer four-stroke technology can reduce these emissions to meet current regulatory standards for both water and air quality (US EPA 1996a). The percentage of emissions of BTEX and MTBE compounds from four-stroke inboard or outboard motors is less than those from a two-stroke outboard engine or an existing two-stroke PWC engine (see Figure 1).

**FIGURE 1: PERCENTAGE OF EMISSIONS FROM UNBURNED FUEL IN PRIVATE WATERCRAFT**



Source: TRPA 1999.

\*Two-cycle outboard does not account for PWC.

## GUIDING REGULATIONS AND POLICIES

The U.S. Environmental Protection Agency has developed national recommended ambient water quality criteria for approximately 120 priority pollutants and 45 non-priority pollutants for the protection of both aquatic life and human health (through ingestion of fish/shellfish or water) (US

EPA 1998). These criteria have been adopted as enforceable standards by most states. There are no EPA water quality criteria for the protection of aquatic life for the PWC-related contaminants (US EPA 1999a). For the human health criteria, however, the Environmental Protection Agency has established criteria for benzene and several PAH compounds. There are no criteria for xylene. Although there is no federal drinking water standard for MTBE, it is on the “Contaminant Candidate List” for consideration in setting health standards; there is no information about the long-term effects that MTBE can have (US EPA 2001b). However, in 2001 a MTBE Water Quality Criteria Work Group (MTBE-WQCWG) was established, consisting of representatives from private companies, trade associations, and the Environmental Protection Agency. This partnership generated the toxicity data necessary for deriving ambient water quality criteria for MTBE, and calculated “preliminary freshwater and marine criteria” for acute and chronic exposure effects (Mancini et al. 2002).

The National Park Service’s *Management Policies 2001* state that National Park Service will perpetuate surface water and groundwater as integral components of park aquatic and terrestrial ecosystems (*Management Policies 2001*, sec. 4.6.1). Furthermore, the National Park Service will determine the quality of park surface and groundwater resources and avoid, whenever possible, the pollution of park waters by human activities occurring within and outside of parks, by

working with appropriate governmental bodies to obtain the highest possible standards available under the Clean Water Act for the protection of park waters

taking all necessary actions to maintain or restore the quality of surface water and groundwater within the parks consistent with the Clean Water Act and all other applicable federal, state, and local laws and regulations

entering into agreements with other agencies and governing bodies, as appropriate, to secure their cooperation in maintaining or restoring the quality of park water resources (*Management Policies 2001*, sec. 4.6.3)

The mission of Assateague Island National Seashore is to “preserve and protect [the] unique coastal resources and the natural ecosystem conditions and processes.” To achieve this, one long-term water quality goal was identified in the park’s *Strategic Plan*:

*Water Quality* — By September 30, 2005, the oceanic and estuarine surface waters of Assateague Island National Seashore have unimpaired water quality.

Assateague Island National Seashore does not have quantifiable water quality data documenting the effects of PWC emissions since they were introduced in the 1970s. To address water quality impacts potentially resulting from continued PWC use, water quality standards were used in the absence of park-specific data as a basic principle to guide the analysis.

Simply stated, a water quality standard defines the water quality goals for a waterbody by designating uses to be made of the water, by setting minimum criteria to protect the uses, and by preventing degradation of water quality through antidegradation provisions. The antidegradation policy is only one portion of a water quality standard. Part of this policy (40 CFR 131.12(a)(2)) strives to maintain water quality at existing levels if it is already better than the minimum criteria necessary to protect the uses. Antidegradation should not be interpreted to mean that “no degradation” can or will occur, as even in the most pristine waters, degradation may be allowed for certain pollutants as long as it is temporary and short-term in nature (Rosenlieb, NPS, WRD, pers. comm., June 2001).

Other considerations in assessing the magnitude of water quality impacts is the effect on those resources that depend on a certain quality or condition of water. Sensitive aquatic organisms,

submerged aquatic vegetation, riparian areas, and wetlands are affected by changes in water quality from direct and indirect sources.

## **METHODOLOGY AND ASSUMPTIONS**

In order to assess the magnitude of water quality impacts to park waters under the various PWC management alternatives, the following methods and assumptions were used:

1. The regulation at 40 CFR 131.12(a)(2) represents an overall goal or principle with regard to PWC use in that the park will strive to fully protect existing water quality so that “fishable/swimmable” uses and other existing or designated uses are maintained. Therefore, PWC use could not be authorized to the degree that it would lower this standard and affect these uses. To do so would potentially violate 40 CFR 131.10, which basically forbids the removal of an existing use because the activity was authorized knowing this level of pollution would occur.
2. State water quality standards governing the waters of the park were examined; where standards or water quality criteria were not available for pollutants present in PWC emissions, ecological and human health toxicity benchmarks for certain pollutants were acquired from various literature sources. The classification of park waters by the state was defined; and the overall sources of water pollutants, both internal and external to the national seashore boundary, were identified in relation to the standards and classification.
3. Baseline water quality data, especially for pollutants associated with two-stroke engines (PAHs and BTEX), were examined, when available.
4. Typical use patterns of motorized watercraft, including numbers and hours used, were determined from state boating data (boating licenses issued, with extrapolation of visitation to the park), aerial surveys conducted by the Maryland Department of Natural Resources, and seasonal observations by park staff. PWC use in relation to overall motorized watercraft recreation at the national seashore was extrapolated from this data from counts during peak summer periods from 1990 through 2000, and from observations by park personnel during a holiday weekend. Use trends for motorized watercraft (PWC and motorboats) were estimated for the next 10 years for all three studied areas (Ocean City Inlet, Sinepuxent Bay, and Little Beach). Information used in the 10-year projections included national and regional data (Accomack County, Virginia, and Worcester County, Maryland). While boating activity is distributed over a full day from 4 A.M. to 6 P.M., it peaks between 9 A.M. and 3 P.M. The contaminant loading to water was calculated for one day, assuming a given number of personal watercraft (i.e., on average, eight personal watercraft operating per hour in Ocean City Inlet, see Table 15) operating for four hours (32 PWC-hours during the peak hours from 10 A.M. to 2 P.M.), each discharging 11.34 liters of gasoline per hour. Four hours of PWC operations also was assumed for each of the other two areas (Sinepuxent Bay and Little Beach).
5. Since no models were available to predict concentrations in water of selected pollutants emitted by personal watercraft and motorboats, an approach was developed to estimate whether typical PWC (and outboard motor) use over a particular time (e.g., over a typical busy weekend day) would result in exceedances of the identified standards, criteria, or toxicity benchmarks. The approach is described in a separate document (see appendix C). Results of this approach were then taken into account, along with site-specific information about water flow, currents, mixing, wind, turbidity, etc., as well as the specific fate and transport characteristics of the pollutant involved (e.g., volatility), to assess the potential for the occurrence of adverse water quality impacts.

6. In general, the approach provides the information needed to calculate emissions to the receiving waterbody from personal watercraft (and, by estimation, from outboard motors) of MTBE and selected hydrocarbons whose concentrations in the raw gasoline fuel were available in the literature and for which ecological and/or human health toxicity benchmarks could be acquired from the literature. The selected chemicals were benzene, MTBE, and three PAHs (benzo(a) pyrene, naphthalene, and 1-methyl naphthalene). First the emissions of these pollutants to the water per PWC operational hour (based on literature values) was estimated, and then the total loading of the pollutants into the water, based on the estimated hours of use, was estimated. The next step was to estimate the volume of water it would take to dilute the calculated emission loading to the level of the water quality standard or benchmark. The volume of water (referred to as the “threshold volume of water”) was then compared to the total available volume of water, and all the mechanisms that result in loss of the pollutant from the water were also qualitatively considered. In this way, an assessment could be made as to the potential for the standards or benchmarks to be exceeded, even on a short-term basis. A conservative approach was used to calculate MTBE emissions at Assateague Island National Seashore. Although Maryland and Virginia gasoline contains approximately 10% MTBE, the regular content varies between 2% and 15%. Consequently, a base of 15% was used for the estimation of threshold volumes.

Although there is no clear definition of how MTBE, BTEX, and PAHs resulting from marine engine exhaust affect human and aquatic health, the physical characteristics and natural tendencies of the inner bays along Assateague Island National Seashore establish longer retention times for pollutants and contaminants. As a result, exposure time, concentrations, and risks associated with these pollutants may increase over time.

Hydrocarbons also have the potential to accumulate in the sediment and solids on which marine mammals feed. As a result of bioaccumulation, long-term adverse health effects in the mammals and humans who use marine life as a food source are possible. BTEX and MTBE compounds tend to transfer from water to air more rapidly than PAHs. PAHs, however, do not dissolve easily in water and tend to bond to particulate matter and settle to the bottom sediments. Research has found that increased exposure to PAHs can adversely affect immune systems and has the potential to cause cancer in humans (ATSDR 2001).

7. The principal mechanisms that result in loss of the pollutant from the water also were qualitatively considered. Many organic pollutants that are initially dissolved in the water volatilize to the atmosphere, especially if they have high vapor pressures, are lighter than water, and mixing occurs at the air/water interface. Other compounds that have low vapor pressure, low solubility, and high octanol/water partition coefficients tend to adhere to organic material and clays and eventually adsorb onto bottom sediments. By considering movements of the organics through the water column, an assessment can be made as to whether there could be an issue with standards or benchmarks being exceeded, even on a short-term basis. Assateague Island is a marine/estuarine environment, and no established water quality criteria are available for PWC-related contaminants. Some states (e.g., New York, Washington) utilize freshwater quality criteria to assess effects on marine/estuarine organisms for a variety of chemical parameters. In the absence of established criteria at either the federal or state level, this analysis adopted freshwater ecological benchmarks (except for 1-methyl naphthalene) and the yet to be adopted preliminary water quality criteria for MTBE (determined by the MTBE-WQCWG) to determine potential water quality impacts. Site-specific data on pollution from emissions was calculated for all sites currently open to PWC use. The threshold volume was determined by considering the PWC-hours of operation for each site and the loadings during operating hours, and the ecotoxicological or human health benchmarks obtained from literature (see Table 17).



TABLE 17: TOXICOLOGICAL BENCHMARKS USED IN CALCULATIONS

Chemical	Ecotoxicological Benchmark (µg/L)	Source	Human Health Benchmark** (µg/L)	Source
Benzo(a)pyrene	0.5	Suter & Tsao 1996; US EPA 1999	0.0044	EPA 1999**
Naphthalene	62	Suter & Tsao 1996	--	--
1-methyl naphthalene	19-34*	USFWS 2000	--	--
Benzene	130	Suter & Tsao 1996	1.2	EPA 1999**
MTBE	57,000	Wong et al. 2001	--***	--
MTBE ****	53,000 (a) and 18,000 (b)	Mancini, et al. 2002		

\* Based on LC<sub>50</sub>s of 1900 and 3400 µg/L for dungeness crab and sheepshead minnow, respectively; 19 µg/L used for estuarine calculations.

\*\* Based on the consumption of fresh water and fish.

\*\*\* Toxicological information for MTBE is currently under review. There is no EPA human health benchmark, but California has established a public health goal of 13 µg/L for fresh water.

\*\*\*\* Preliminary marine criteria for acute (a) and chronic (c) benchmarks.

Benzene, when released to the water, is subject to rapid volatilization, with a half-life for evaporation of about 5 hours (US EPA 2001a). (Calculated concentrations are shown in appendix C).

8. The threshold volume of water was calculated in acre-feet (1 acre-foot = 1 acre of water 1 foot deep). For example, if results showed that for benzo(a)pyrene, 55 acre-feet of water would be needed to dilute the expected emissions to the benchmark level, and the receiving body of water is a 100-acre reservoir with an average depth of 20 feet (= 2000 acre-feet) and is well-mixed, then this would indicate little chance of a problem, especially when adding in the effects of any other processes that contribute to the loss of the benzo(a)pyrene from the water column. However, if the impact area is a 5-acre backwater area averaging 2 feet deep (10 acre-feet), then there may be at least a short-term issue, especially if outboard emissions are added and/or if there is little mixing in the area. At Assateague Island the area for determining water volumes was established from NOAA nautical charts (NOAA 2000) and includes the national seashore's jurisdictional waters, as well as those areas used by personal watercraft and that may have a direct or indirect effect on park waters.
9. To assess cumulative impacts, outboard emissions were also estimated, based on estimates of relative emissions of unburned fuel and hours of use. Then, motorboat emissions were added to PWC emissions to get a more complete estimation of loading to the receiving waterbody. Inboards contribute very little to the loading and were not included in the estimation. The figures used for relative loading from various outboard engines have been obtained from reported data.
10. To predict the cumulative effects of PWC emissions in the context of all other similar types of emissions, projections of existing use were extrapolated into the future as a percentage of overall emissions in order to gage the magnitude of potential water quality changes, with and without continued PWC use at the park, and taking into account the reduction in emissions required by the Environmental Protection Agency over the next years (see Table 18 for the dates that these reductions are scheduled to occur).

Key dates in this chronology begin with 1999, when the U.S. Environmental Protection Agency began to require production line testing for 75% hydrocarbon reduction in new outboard motors, and 2000, when testing for 75% hydrocarbon reduction in personal watercraft was required. By 2006 all new personal watercraft and outboards manufactured in the United States must have a 75% reduction in hydrocarbon emissions. In 2005 and 2012 overall reductions in hydrocarbon emissions are estimated to be 25% and 50%, respectively.

**TABLE 18: REDUCTION IN EMISSIONS REQUIRED BY THE ENVIRONMENTAL PROTECTION AGENCY**

Date	Action
1999	EPA requires production line testing for 75% HC reduction in new outboards and begins to see reductions as newer models are introduced (US EPA 1977A).
2000	EPA requires production line testing for 75% HC reduction in new personal watercraft and begins to see reductions as newer models are introduced (US EPA 1977A).
2005	Estimate 25% reduction in HC emissions overall as a result of newer models being gradually used (US EPA 1996; date modified in EPA 1977A).
2006	EPA fully implements 75% HC reduction in new outboards and personal watercraft (US EPA 1996).
2012	Estimate 50% reduction in HC emissions overall (US EPA 1996; date modified in EPA 1977A)

These estimates are based on interpolations of the emissions reduction percentages and associated years reported by the Environmental Protection Agency (1996), but with a one-year delay in the implementation of production line testing (US EPA 1997a). A change in the national socioeconomic conditions (as well as industry's marketing strategies) could cause this trend to vary one way or the other.

## STUDY AREA

The areas of boating activities summarized and evaluated included waters at the Ocean City Inlet (as well as 500 yards of shoreline on the ocean side of the island immediately adjacent to Ocean City Inlet, and 500 yards on the backbay), Sinepuxent Bay (NPS jurisdictional waters and open bay north of the SR 611 bridge), and Little Beach and Tom's Cove.

## IMPACT TO WATER QUALITY FROM PWC USE

Given the above methodology and assumptions, the following impact thresholds were established in order to describe the relative changes in water quality (both overall, localized, short and long term, cumulatively, adverse and beneficial), under the various PWC management alternatives, when compared to baseline conditions (alternative A).

*Negligible:* Impacts are chemical, physical, or biological effects that would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.

*Minor:* Impacts (chemical, physical, or biological effects) would be detectable but would be well below water quality standards or criteria and within historical or desired water quality conditions.

*Moderate:* Impacts (chemical, physical, or biological effects) would be detectable but would be at or below water quality standards or criteria; however, historical baseline or desired water quality conditions would be altered on a short-term basis.

*Major:* Impacts (chemical, physical, or biological effects) would be detectable and would be frequently altered from the historical baseline or desired water quality conditions; and/or chemical, physical, or biological water quality standards or criteria would be locally slightly and singularly exceeded on a short-term and temporary basis.

*Impairment:* Impacts are chemical, physical, or biological effects that would be detectable and would be substantially and frequently altered from the historical baseline or desired water

quality conditions and/or water quality standards, or criteria would be exceeded several times on a short-term and temporary basis. In addition, these adverse, major impacts to park resources and values would

contribute to deterioration of the park's water quality and aquatic resources to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's general management plan or other park planning documents.

### **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** The main issues associated with PWC use and water resources at Assateague Island are those related to water quality. The impacts can be classified as chemical and physical ones. Impacts to water quality draw from emissions of hydrocarbons directly into the water. Physical impacts are those associated with the resuspension of sediments and consequent increase in turbidity that occurs during PWC operation in shallow waters.

The impacts to water quality vary according to the usage areas described (e.g., flushing in the inlets reduces the potential impact to water quality). Under this alternative the seashore's waters would be closed to PWC use except in the Ocean City Inlet on the island's north end, in the vicinity of Little Beach on the island's south end, and in the area between the SAV buoys and the seashore boundary in Sinepuxent Bay. The user trend analysis shows an increase of 1.5% a year in the overall average number of personal watercraft operating per hour in these waters. Therefore, PWC use is projected to increase from 8.1 to 9.4 in Ocean City Inlet, from 5.1 to 5.9 in Sinepuxent Bay, and from 2 to 2.4 in the Little Beach area. A change in the national socioeconomic conditions (as well as industry's marketing strategies) may cause this trend to vary one way or the other.

In addition, a reduction in impacts to water quality associated with emission of pollutants is expected in the long term due to the fact that PWC emissions would become lower as illustrated by the EPA emission projections of 25% and 50% reductions in hydrocarbons by 2005 and 2012 as a result of newer models being gradually used (US EPA 1996a; date modified in EPA 1997a). However, for some PWC-related pollutants, the available volumes of water in the study areas are not sufficient to dilute PWC loadings of contaminants below established human health and toxicological benchmarks, even under 2012 emission levels. The summary of threshold volumes (acre-feet) for this alternative are presented below. They were developed utilizing the PWC user projections shown in Table 13 and Table 14, with estimated use of 4 hours per day per machine and the forecast reductions in emissions by 2012.

The results of the water quality analysis for PWC activity show that for all emitted pollutants, the ecotoxicological threshold volumes would be well below calculated volumes of water at all three study areas (from 2002 through 2012). Thresholds ranged from 0.1 to 44 acre-feet, while available volumes range from 81 to 1,944 acre-feet (see Table 19). Therefore, impacts would be negligible.

**TABLE 19: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE A**

Threshold Volume Available		Calculated Threshold Volumes (acre-feet)					
		Ocean City Inlet		Sinepuxent Bay		Little Beach	
		81 acre-feet (56 ac-ft in NPS jurisdictional waters)		1,944 acre-feet (384 ac-ft in NPS jurisdictional waters)		240 acre-feet (240 ac-ft in NPS jurisdictional waters)	
		2002	2012	2002	2012	2002	2012
Ecotoxicological Benchmarks	Benzo(a)pyrene	44	26	27	16	11	6.5
	Naphthalene	18	10	11	6.5	4.4	2.6
	1-methyl naphthalene	27	16	17	9.8	6.7	3.9
	Benzene	42	25	26	15	10	6.1
	MTBE (Freshwater)	0.57	0.34	0.35	0.21	0.14	0.08
	MTBE (Marine) *	0.61	0.36	0.38	0.22	0.15	0.09
Human Health Benchmarks	Benzo(a)pyrene	140	82	88	52	38	22
	Benzene	4,500	2,646	2,800	1,646	1,100	647
	MTBE	2,500	1,470	1,600	941	620	365

\* Preliminary marine criteria (threshold volume) for acute (top) and chronic (bottom) exposure effect protection (Mancini et al. 2002).

For the human health benchmarks, the water volumes available at the three study areas are less than the calculated thresholds for benzene and MTBE, and for benzo(a)pyrene at Ocean City Inlet. Although the marine/estuarine waters around Assateague Island National Seashore are not used for drinking purposes, visitors could be affected by an increase in pollutant loadings through ingestion of contaminated biota (e.g., shellfish) or skin absorption when swimming. However, exposure of swimmers is low, since most swimming takes place in areas (i.e., Little Beach) where PWC use is low.

At the Ocean City Inlet all three contaminant threshold volumes (human health) are currently above the available volume of water (81 acre-feet). For the year 2012 emission levels, only benzo(a)pyrene would be at an acceptable level. However, while the estimated volume of water at Ocean City Inlet is only 81 acre-feet, this inlet is characterized by the presence of strong tidal currents twice a day. During outgoing ebb tides the entire area of the inlet is exchanged several times its volume with adjacent Sinepuxent Bay or ocean waters. As an example, during each 6-hour half-tidal cycle, an estimated 766 million cubic feet of water are exchanged through the inlet each 6 hours, equaling 215 times the volume of the inlet (81 ac-ft), or one complete turn-over every 2 minutes. This large tidal exchange would significantly dilute PWC-related pollutants in the inlet. Therefore, all calculated threshold volumes and their associated impacts would be effectively reduced.

In Sinepuxent Bay threshold volumes associated with human health effects for benzo(a)pyrene and MTBE would be less than available water volume (1,944 acre-feet) in 2002 and 2012. The benzene threshold volume for 2002 would exceed the available volume. In Sinepuxent Bay environmental conditions may favor accumulation of contaminants to levels that pose a risk to the aquatic environment and humans. Average water depths in this area (2 to 5 feet), stagnation of the water towards the center of the bay, and limited exchange during tidal flows may favor the accumulation of organic contaminants in sediments and increase the exposure time and bioaccumulation by aquatic biota. Also, pollutants discharged in Ocean City Inlet during flood tides would be moved into the area of the bay near the inlet. These conditions might create moderate, long-term, adverse impacts on local aquatic biota. However, the available water volume in Sinepuxent Bay is above that calculated ecotoxicological threshold volume. Long-term effects may be an issue with PAHs due to bioaccumulation and the physical conditions in the bay. Shellfishing (clamming) activities take place at Assateague by both park visitors and leases for commercial purposes in the Tom's Cove area. These clams may be exposed to pollutants (e.g., PAHs), increasing the risk of exposure for humans. However, most of this clamming activity takes place in the southern end of the island away from most PWC activity (Tom O'Connell, VADCR, pers. comm., 2001).

At Little Beach, only the benzo(a)pyrene threshold volume for human health would be below the available water volume; benzene and MTBE threshold volumes would exceed the available volume. At Little Beach (Chincoteague Inlet), currents are less intense; however, similar conditions to those at the Ocean City Inlet (water exchange) are present.

It is important to emphasize that while these pollutants might exceed available water volumes, the environmental conditions at the study areas (e.g., water exchange, temperature, weather condition), as well as the behavior, fate, and transport of these chemicals, play an important role in limiting potential impacts to human health and the aquatic environment. As described in previous sections of this report, some literature indicates that even small PAH concentrations may have toxic effects on aquatic organisms. These compounds can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks. Most PAHs do not dissolve easily in water. They stick to suspended solid particles and settle to the bottom sediments. Benzene is volatile and has a half-life of approximately 5 hours in water (US EPA 2001). Contrary to PAHs, benzene does not bioaccumulate in plants or animals (ATSDR 1997). Exposure to humans is mainly through breathing air that contains benzene, although some may enter the body by passing through the skin. Most benzene (and its metabolites) would leave the human body through urine within 48 hours. MTBE has a half-life of 4 hours (ATSDR 1996). It is not considered a major harmful pollutant and is not included in routine national monitoring programs for liquids. Not as much gets into the blood through the skin, and the majority may enter the body through breathing or ingestion. However, it does not accumulate, and its metabolites (e.g., butyl alcohol, formic acid, CO<sub>2</sub>), are breathed out or leave the body through urine within one or two days (ATSDR 1996).

Water quality impacts of PWC use under alternative A would be negligible for all ecotoxicological benchmarks in 2002 and 2012 in all areas of the seashore where PWC use would be allowed. For human health benchmarks, impacts would be negligible for benzo(a)pyrene from 2002 through 2012. For benzene, impacts would be moderate in Sinepuxent Bay and Little Beach in 2002, becoming negligible to minor by 2012. Impacts from benzene may be further reduced due to its volatility and short half-life. For MTBE, impacts would be negligible to minor in Sinepuxent Bay in 2002, decreasing to negligible by 2012; in Ocean City Inlet and Little Beach impacts would be minor to moderate, decreasing to minor by 2012.

**Cumulative Impacts.** Cumulative impacts associated with alternative A would result from various actions taking place around Assateague Island National Seashore, including motorboats that use nearby waters, point- and non-point sources of pollutants (urban and agriculture), and coastal development, particularly in the vicinity of Ocean City. The extensive marine traffic (other than personal watercraft) in Ocean City Inlet constitutes an important source of pollutants to the aquatic environment. Per hour, the average number of all boats observed at this site was 56 (of which 8 were personal watercraft). These boats included commercial (fishing boats and cruises), recreational (personal use), and official units (police, Coast Guard, MDNR). In addition, municipal discharges from the Ocean City area, as well as from local marinas, are important sources of hydrocarbons.

Tour boat emissions were evaluated and dismissed as insignificant, representing a small proportion of the boats present in the study area. Generally, they use these waters (Ocean City Inlet) only as a navigational channel and do not remain in the area more than 5 to 10 minutes at a time. In addition, these boats use diesel engines (contrary to the typical two-stroke engine boat that use a gas mixture), and while operating in the inlet they travel at low speeds with reduced fuel usage when compared to normal running speed.

The current cumulative effects for all activities (as shown in Table 20) in Ocean City Inlet, Sinepuxent Bay, and Little Beach would be negligible for all ecotoxicological benchmarks. Threshold water volumes in Sinepuxent Bay and the Little Beach area would range between 0.28 and 70 acre-feet in 2002 and between 0.17 and 41 acre-feet in 2012, well below what is available in each area (1,944 and 240 acre-feet, respectively). Flushing and dilution factors in these areas would substantially reduce the risk for ecotoxicological impacts. In the Ocean City Inlet, while the required threshold volumes would exceed what is available for all contaminants except MTBE, the high water turn-over rate would effectively reduce the calculated threshold volumes for the inlet, resulting in negligible impacts.

**TABLE 20: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE A**

		Calculated Threshold Volumes (acre-feet)					
		Ocean City Inlet		Sinepuxent Bay		Little Beach	
Threshold Volume Available		81 acre-feet (56 ac-ft in NPS jurisdictional waters)		1,944 acre-feet (384 ac-ft in NPS jurisdictional waters)		240 acre-feet (240 ac-ft in NPS jurisdictional waters)	
		2002	2012	2002	2012	2002	2012
Ecotoxicological Benchmarks	Benzo(a)pyrene	290	171	70	41	22	13
	Naphthalene	110	65	29	17	8.8	5.2
	1-methyl naphthalene	190	112	33	20	13	7.9
	Benzene	270	159	67	39	21	12
	MTBE (Freshwater)	3.7	2.2	0.90	0.53	0.28	0.17
	MTBE (Marine) *	3.9	2.3	1.1	1.1	0.30	0.18
Human Health Benchmarks		12	6.9	3.1	1.8	0.90	0.53
	Benzo(a)pyrene	920	541	230	135	76	45
	Benzene	29,000	17,052	7,400	4,351	2,300	1,352
	MTBE	16,000	9,408	4,100	2,411	1,200	706

Notes: The analysis summarizes the cumulative impacts of two-stroke motorboats (92% of all watercraft present in the study area). A conservative approach was adopted by assuming that all two-stroke motorboats larger than 16 feet have similar emission rates to those of personal watercraft.

During 2001, 52 motorboats per hour (noon) were used in the Ocean City Inlet, 13 in Sinepuxent Bay, and 4 in the Little Beach area.

\* Threshold volume based on preliminary marine criteria for acute (top) and chronic (bottom) exposure effect protection (Mancini et al. 2002).

For human health benchmarks, impacts from benzo(a)pyrene would be negligible in Sinepuxent Bay and Little Beach from 2002 through 2012, and negligible to minor in the Ocean City Inlet throughout this period because of flushing. For benzene and MTBE, impacts would be moderate to major in all PWC use areas in 2002, decreasing to minor to moderate by 2012. The cumulative impacts for this alternative would be short term because most boating activities take place during midday, allowing for flushing time in the inlets, and are temporary, occurring primarily during summer months. Pollutants discharged in Ocean City Inlet likely end up in Sinepuxent Bay during flood tide, where they would likely remain for a longer period of time because of reduced flushing. Moderate, long-term impacts could occur to aquatic biota of Sinepuxent Bay due to the bioaccumulation of PAHs, and potentially to humans ingesting these organisms.

Monitoring for benzene and MTBE should be done in all areas to verify whether these estimates are correct and whether other mitigating measures might be required (such as allowing only four-stroke engines for boats and personal watercraft).

As previously mentioned, the potential for humans to be exposed to these compounds through drinking water is minimal since the area is not a source of potable water. Ingestion of shellfish is possible; however, the risk of extended exposure to contaminated shellfish is predicted to be low due to the limited number of commercial shellfish beds in the affected area. Exposure through skin for

swimmers is also low; most of the swimming activity takes place in areas (i.e., Little Beach) where PWC use is low.

**Conclusion.** PWC use within the national seashore would result in negligible impacts for all ecotoxicological benchmarks from 2002 through 2012. For human health benchmarks, impacts would be negligible for benzo(a)pyrene throughout the assessment period. Impacts from benzene would be minor to moderate in the Ocean City Inlet, but moderate to negligible or minor from 2002 to 2012 in Sinepuxent Bay and Little Beach. The short half-life of benzene would further reduce its estimated impacts. Pollutants would be rapidly dispersed in the Ocean City Inlet by intense flushing action, substantially reducing concerns to human health from MTBE and benzene.

On a cumulative basis the decline in pollutants as a result of EPA's emission requirements would have a beneficial, long-term impact on the local water quality. Impacts would be negligible for all ecotoxicological benchmarks and negligible to minor for benzo(a)pyrene based on human health benchmarks. For benzene and MTBE, impacts are expected to be moderate to major in 2002 in all areas, decreasing to minor to moderate by 2012. Monitoring for benzene and MTBE should be done in all areas to verify whether projected levels are correct and whether other mitigating measures might be required (such as allowing only four-stroke engines for boats and personal watercraft).

No impairment to water quality is expected in any area under this alternative.

### Impacts of Alternative B — Continue PWC Use under a Special Regulation, but Limit Area of Use

**Analysis.** Closing Sinepuxent Bay to PWC use under this alternative would help reduce impacts to water quality in this area, while the impacts to water quality in Ocean City Inlet and Little Beach would be similar to those described for alternative A.

**TABLE 21: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE B**

Threshold Volume Available		Calculated Threshold Volumes (acre-feet)			
		Ocean City Inlet		Little Beach	
		81 acre-feet (56 ac-ft in NPS jurisdictional waters)		240 acre-feet (240 ac-ft in NPS jurisdictional waters)	
		2002	2012	2002	2012
Ecotoxicological Benchmarks	Benzo(a)pyrene	44	26	11	6.5
	Naphthalene	18	10	4.4	2.6
	1-methyl naphthalene	27	16	6.7	3.9
	Benzene	42	25	10	6.1
	MTBE (Freshwater)	0.57	0.34	0.14	0.082
	MTBE (Marine) *	0.61	0.36	0.15	0.088
Human Health Benchmarks		1.8	1.1	0.45	0.26
	Benzo(a)pyrene	140	82	38	22
	Benzene	4,500	2,646	1,100	647
	MTBE	2,500	1,470	620	365

\* Threshold volume based on preliminary marine criteria for acute (top) and chronic (bottom) exposure effect protection (Mancini et al. 2002).

Impacts of PWC use for ecotoxicological benchmarks would be negligible in Ocean City Inlet and Little Beach throughout the assessment period because water volumes would exceed calculated thresholds. Required threshold water volumes range between 0.082 and 44 acre-feet (compared to 81 acre-feet available in Ocean City Inlet and 240 acre-feet in the Little Beach area).

Impacts to human health from PWC-related pollutants would be similar to those described for alternative A. PAH would be the most critical pollutants due to bioaccumulation and the potential impacts on humans through ingestion of aquatic biota. Benzo(a)pyrene threshold volumes would exceed the volume in Ocean City Inlet in 2002 and would slightly exceed it in 2012. At Little Beach, benzo(a)pyrene threshold volumes would be below the volume in 2002 and 2012. Similar to alternative A, benzene and MTBE threshold volumes would exceed the Little Beach volume (even for forecasted 2012 emission reductions). However, the existing environmental conditions (flushing), as well as the half-lives of these pollutants, would reduce the potential risk to human health.

This alternative would have a beneficial long-term impact to aquatic biota of Sinepuxent Bay due to the closing of this area to PWC use.

**Cumulative Impacts.** As described for alternative A, cumulative effects of all motorboat activities would continue in national seashore waters; however, prohibiting PWC use in Sinepuxent Bay would remove this source of impacts to the bay. In Ocean City Inlet and Little Beach all area activities would continue to have negligible impacts based on ecotoxicological benchmarks. For human health benchmarks, benzo(a)pyrene levels would be negligible to minor in 2002, decreasing to negligible in 2012. Benzene and MTBE levels would be the same as those described for alternative A in Ocean City Inlet and Little Beach. Benzene levels at both locations would be moderate to major in 2002, decreasing to moderate by 2012. MTBE levels in Ocean City Inlet would be moderate to major in 2002, decreasing to moderate by 2012. MTBE levels in Little Bay would be moderate in 2002, decreasing to minor to moderate by 2012. The cumulative impacts for this alternative would be short term since most boating activities take place during midday hours allowing for flushing time in the inlets and primarily during summer months.

**TABLE 22: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE B**

		Calculated Threshold Volumes (acre-feet)					
		Ocean City Inlet 81 acre-feet (56 ac-ft in NPS jurisdictional waters)		Sinepuxent Bay 1,944 acre-feet (384 ac-ft in NPS jurisdictional waters)		Little Beach 240 acre-feet (240 ac-ft in NPS jurisdictional waters)	
Threshold Volume Available		2002	2012	2002	2012	2002	2012
Ecotoxicological Benchmarks	Benzo(a)pyrene	290	171	43	25	22	13
	Naphthalene	110	65	18	10	8.8	5.2
	1-methyl naphthalene	190	112	17	10	13	7.9
	Benzene	270	159	41	24	21	12
	MTBE (Freshwater)	3.7	2.2	0.55	0.32	0.28	0.17
	MTBE (Marine) *	3.9	2.3	0.72	0.42	0.30	0.18
		12	6.9	2.0	1.2	0.90	0.53
Human Health Benchmarks	Benzo(a)pyrene	920	541	142	83	76	45
	Benzene	29,000	17,052	4,600	2,705	2,300	1,352
	MTBE	16,000	9,408	2,500	1,470	1,200	706

Notes: The analysis summarizes the cumulative impacts of two-stroke motorboats (92% of all watercraft present in the study area). A conservative approach was adopted by assuming that all two-stroke motorboats larger than 16 feet have similar emission rates to those of personal watercraft.

\* Preliminary marine criteria (Threshold Volume) for acute (top) and chronic (bottom) exposure effect protection (Mancini et al. 2002). During 2001, 52 motorboats per hour (noon) were used in the Ocean City Inlet and 4 in the Little Beach area.

The potential for exposure to humans through drinking water is minimal since the area is not a source of potable water. Ingestion of shellfish is possible; however, the risk of extended exposure to contaminated shellfish is predicted to be low due to the limited number of commercial shellfish beds in the affected area. Exposure through skin for swimmers is also low; most of the swimming activity takes place in areas (i.e., Little Beach) where PWC use is low.



**Conclusion.** This alternative would have impacts similar to those described for alternative A in the Ocean City Inlet and Little Beach. Impacts for ecotoxicological benchmarks would be negligible throughout the assessment period. Impacts for human health benchmarks would range from negligible to moderate in 2002, decreasing to minor to moderate by 2012. There would be beneficial impacts in Sinepuxent Bay as a result of prohibiting PWC use within the national seashore in this area.

On a cumulative basis the rapid dispersal of pollutants and the extent of current use at the northern and southern landing sites would result in negligible to moderate impacts on water quality. Reductions in pollutants by 2012 would have a beneficial long-term impact on local water quality at both inlets. However, MTBE and benzene loadings would continue to be moderate to major in 2002, decreasing to minor to moderate in 2012. Monitoring for benzene and MTBE should be done in all areas to verify whether projected levels are correct and whether other mitigating measures might be required (such as allowing only four-stroke engines for boats and personal watercraft).

No impairment to water quality is expected under this alternative.

### Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Limit Area of Use and Implement Other Management Restrictions

**Analysis.** Similar to alternative B, alternative C would allow PWC use only at the two landing areas in the northern and southern ends of the island. In addition, PWC operators would have to travel at no-wake speeds (maximum 6 mph) when accessing landing points within the seashore boundary. This restriction would limit PWC use for recreational purposes and tend to encourage PWC use only for transportation purposes. In addition, this management restriction would assist in reducing emissions of pollutants due to lower fuel consumption at lower speeds (estimated to be 10% of full-throttle emission rates).

Under this alternative all threshold volumes for ecotoxicological benchmarks would be well below available water volumes at the inlets, and impacts would be negligible for all compounds (ecotoxicological and human health benchmarks) over the assessment period (2002 through 2012). So this alternative would be more protective of aquatic life and human health than alternative A.

**TABLE 23: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE C**

Threshold Volume Available		Calculated Threshold Volumes (acre-feet)			
		Ocean City Inlet		Little Beach	
		81 acre-feet (56 ac-ft in NPS jurisdictional waters)		240 acre-feet (240 ac-ft in NPS jurisdictional waters)	
		2002	2012	2002	2012
Ecological Benchmarks	Benzo(a)pyrene	4.4	2.6	1.1	0.65
	Naphthalene	1.8	1.0	0.44	0.26
	1-methyl naphthalene	2.7	1.6	0.67	0.39
	Benzene*	4.2	2.5	1.0	0.59
	MTBE	0.057	0.034	0.014	0.0082
	MTBE (Marine) *	0.061	0.036	0.015	0.0088
Human Health Benchmarks		0.18	0.11	0.045	0.026
	Benzo(a)pyrene	14	8.3	3.8	2.2
	Benzene	450	265	110	65
	MTBE	250	147	62	37

Note: Under this alternative no-wake zones would be established within NPS jurisdictional waters. The calculated threshold volume corresponds only to NPS jurisdictional waters. An additional 30% volume should be added to the Ocean City Inlet estimate and 10% to Little Beach. It is assumed that at no-wake speeds motorized craft burn 10% of the total fuel burned at full throttle.

\* Threshold volume based on preliminary marine criteria for acute (top) and chronic (bottom) exposure effect protection (Mancini et al. 2002).

**Cumulative Impacts.** As described for alternative A, cumulative effects of all motorboat activities would continue in national seashore waters; however, prohibiting PWC use in Sinepuxent Bay (as described for alternative B) would remove this source of impacts. In Ocean City Inlet and Little Beach all area activities would continue to have negligible impacts with regard to ecotoxicological benchmarks. For human health benchmarks benzo(a)pyrene levels would be negligible to minor throughout the assessment period. Benzene and MTBE levels would be moderate to major at Ocean City Inlet in 2002, decreasing to moderate by 2010. Benzene and MTBE would be minor to moderate in the Little Beach area throughout the assessment period. Impacts would be short-term (most boating activities take place during midday hours allowing for flushing time in the inlets) and temporary (primarily during summer months). This alternative would have long-term, beneficial impacts to aquatic biota and human health. Because PWC users would not be allowed in Sinepuxent Bay, water quality impacts would be from boats only, similar to alternative B.

**TABLE 24: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE C**

		Calculated Threshold Volumes (acre-feet)					
		Ocean City Inlet 81 acre-feet (56 ac-ft in NPS jurisdictional waters)		Sinepuxent Bay 1,944 acre-feet (384 ac-ft in NPS jurisdictional waters)		Little Beach 240 acre-feet (240 ac-ft in NPS jurisdictional waters)	
Threshold Volume Available		2002	2012	2002	2012	2002	2012
Ecotoxicological Benchmarks	Benzo(a)pyrene	250	147	43	25	12	7.1
	Naphthalene	94	55	18	10	4.8	2.8
	1-methyl naphthalene	166	97	17	10	7.4	4.3
	Benzene	323	137	41	24	11	6.7
	MTBE (Freshwater)	3.2	1.9	0.55	0.32	0.16	0.09
	MTBE (Marine) *	3.4 10	2.0 5.9	0.72 2.0	0.42 1.2	0.17 0.49	0.10 0.29
Human Health Benchmarks	Benzo(a)pyrene	794	467	142	83	42	25
	Benzene	24,950	14,671	4,600	2,705	1,310	770
	MTBE	13,750	8,085	2,500	1,470	642	377

Notes: The analysis summarizes the cumulative impacts of two-stroke motorboats (92% of all watercraft present in the study area): A conservative approach was adopted by assuming that all two-stroke motorboats larger than 16 feet have similar emission rates to those of PWC.

\* Threshold volume based on preliminary marine criteria for acute (top) and chronic (bottom) exposure effect protection (Mancini 2002).

During 2001, 52 motorboats per hour (noon) used the Ocean City Inlet and 4 used Little Beach.

Under this alternative, no-wake zones would be established within park jurisdictional waters. These waters comprise 70% of the Ocean City Inlet and 90% of Little Beach. The calculated threshold volume corresponds only to park jurisdictional waters. An additional 30% volume should be added to the Ocean City Inlet estimate and 10% to Little Beach. It is assumed that at no-wake speeds motorized craft burn 10% of total fuel burned at full throttle.

**Conclusion.** Compared to alternative A, this alternative would have beneficial impacts on water quality (pollution and physical impact reduction). Requiring PWC users to operate at no-wake speeds would help reduce nearshore loadings of contaminants, and it could dissuade PWC users from frequenting these sites. This alternative would have a negligible, short-term, adverse effects on water quality in the Ocean City Inlet and Little Beach, and a long-term beneficial impact to aquatic biota of Sinepuxent Bay due to closure of this area to PWC use, thus reducing adverse impacts associated with PWC activities.

Based on environmental conditions in the inlets and the extent of current use in to the northern and southern landing sites, plus the additional speed restrictions under this alternative, PWC and boat use would have a negligible to minor cumulative impact on water quality for all ecotoxicological benchmarks and for benzo(a)pyrene (human health). Impacts of benzene and MTBE at Little Beach would be minor to moderate throughout the assessment period. Impacts of benzene and MTBE in

Ocean City Inlet would be moderate to major in 2002, decreasing to moderate by 2012. The decline of emission rates between the year 2002 and 2012 would have a long-term, beneficial impact on local water quality at both the Ocean City and Little Beach.

No impairment to water quality is expected under this alternative.

### **Impacts of the No-Action Alternative**

**Analysis.** Under the no-action alternative PWC use would be banned within Assateague Island National Seashore waters. This would contribute to improved water quality conditions in areas currently open to PWC use. No emissions would be discharged into the water.

The implementation of the no-action alternative would result in short and long-term beneficial impacts in the future with no PWC emissions released. By 2012 water quality would be improved.

**Cumulative Impacts.** PWC use within the national seashore would not contribute to cumulative impacts under this alternative. Impacts from other sources, including all other forms of motorized recreation, coastal development, point and non-point sources of pollutants, and coastal development, would continue. All area activities would have a short-term, moderate to major adverse impact on the local water quality conditions in backbay waters, and a negligible to minor impact in waters of the Ocean City and Little Beach. The marine traffic at the Ocean City Inlet would continue as a source of pollutants to the aquatic environment. In addition, municipal discharges from Ocean City, as well as local marinas, would continue.

At Sinepuxent Bay and Little Beach, all motorboat activities would produce loadings of some contaminants (benzene and MTBE) in excess of existing water volumes for human health thresholds. Benzo(a)pyrene would not exceed standards in Sinepuxent Bay or the Little Beach area. The cumulative impacts for this alternative would be short term because most boating activities take place during midday hours, allowing for flushing time in the inlets, and temporary, primarily during summer months. Long-term, moderate impacts to aquatic biota of Sinepuxent Bay (due to the bioaccumulation of PAHs), and consequently to humans ingesting these organisms, could occur under this alternative.

Cumulative effects of all motorboat activities combined would continue to be substantial for many of the contaminants of concern. All area activities would continue to have a moderate to major, short-term, adverse impact on the local water quality conditions in backbay waters, and a negligible to minor impact in waters of the Ocean City Inlet and Little Beach.

**Conclusions.** Over the short and long term, discontinuing PWC use within the national seashore would have a beneficial impact by contributing to improved water quality conditions in areas currently open to PWC use.

On a cumulative basis all area activities, as described for alternative A, would continue to have short-term, moderate to major adverse impacts on local water quality conditions in backbay waters, and a negligible to minor impact in waters of the Ocean City Inlet and Little Beach. Over the long term this alternative would have beneficial impacts on water quality.

Water quality would not be impaired.

## AIR QUALITY

Personal watercraft emit various compounds that pollute the air. Up to one third of the fuel delivered to current two-stroke engines goes unburned and is discharged as gaseous hydrocarbons; the lubricating oil is used once and is expelled as part of the exhaust; and the combustion process results in emissions of air pollutants such as volatile organic compounds (VOC), nitrogen oxides (NO<sub>x</sub>), particulate matter (PM), and carbon monoxide (CO) (US EPA 1996a). PWC also emit fuel components such as benzene and fuel additives that are known to cause adverse health effects. Even though PWC engine exhaust is usually routed below the waterline, a portion of the exhaust gases end up in the air. These air pollutants may adversely impact park visitor and employee health, as well as sensitive park resources. For example, VOC and NO<sub>x</sub> emissions, in the presence of sunlight, form ozone, which can cause or contribute to respiratory illness (US EPA 1996c). Ozone is also toxic to sensitive species of vegetation. It causes visible foliar injury, decreases plant growth, and increases plant susceptibility to insects and disease. Carbon monoxide can affect humans as well. It interferes with the oxygen carrying capacity of blood, resulting in lack of oxygen to tissues. NO<sub>x</sub> and PM emissions associated with PWC use can also degrade visibility. NO<sub>x</sub> also contributes to acid deposition effects on plants, water, and soil. However, because emission estimates show that NO<sub>x</sub> from personal watercraft are minimal (less than 5 tons per year), acid deposition effects attributable to PWC use are expected to be minimal.

## GUIDING REGULATIONS AND POLICIES

**Clean Air Act.** The Clean Air Act establishes national ambient air quality standards (NAAQS) to protect the public health and welfare from air pollution. The act also establishes the prevention of significant deterioration (PSD) of air quality program to protect the air in relatively clean areas. One purpose of this program is to preserve, protect, and enhance air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic or historic value (42 U.S.C. 7401 et seq.). The program also includes a classification approach for controlling air pollution.

Class I areas are afforded the greatest degree of air quality protection. Very little deterioration of air quality is allowed in these areas, and the unit manager has an affirmative responsibility to protect visibility and all other class I area air quality related values from the adverse effects of air pollution.

Class II areas include all national park system areas not designated as class I, and the Clean Air Act allows only moderate air quality deterioration in these areas. In no case, however, may pollution concentrations violate any of the national ambient air quality standards.

Assateague Island National Seashore is designated a class II area.

**Conformity Requirements.** National park system areas that do not meet the national ambient air quality standards or whose resources are already being adversely affected by current ambient levels require a greater degree of consideration and scrutiny by National Park Service managers. Areas that do not meet national air quality standards for any pollutant are designated as nonattainment areas. Section 176 of the Clean Air Act states:

No department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to an [State] implementation plan...[T]he assurance of conformity to such a plan shall be an affirmative responsibility of the head of such department, agency or instrumentality

Essentially, federal agencies must ensure that any action taken does not interfere with a state's plan to attain and maintain the national ambient air quality standards in designated nonattainment and maintenance areas. In making decisions regarding PWC use within a designated nonattainment or maintenance area, park managers should discuss their plans with the appropriate state air pollution control agency to determine the applicability of conformity requirements.

Since the Assateague Island National Seashore areas (including Worcester County, Maryland, and Accomack County, Virginia) are all designated by the Environment Protection Agency as in attainment for all criteria pollutants (CO, O<sub>3</sub>, NO<sub>x</sub>, SO<sub>2</sub>, PM<sub>10</sub>, and lead), there is no state implementation plan which applies to the project area. Therefore, the proposed action(s) are not subject to particular federal conformity determination or requirement.

**Applicable PWC Emission Standards.** The U.S. Environment Protection Agency issued the gasoline marine engine final rule in August 1996. The rule, which took effect in 1998, affects manufacturers of new outboard engines and the type of inboard engines used in personal watercraft. The agency adopted a phased approach to reduce emissions. The current emission standards were set at levels that are achievable by existing personal watercraft. By 2006 PWC manufacturers will be required to meet a corporate average emission standard that is equivalent to a 75% reduction in VOC emissions. (The corporate average standard allows manufacturers to build some engines to emission levels lower than the standard and some engines to emission levels higher than the standard, and to employ a mix of technology types, as long as the overall corporate average is at or below the standard.) Because the actual reduction in emissions is dependent on the sale of lower-emitting personal watercraft, the Environmental Protection Agency estimates that a 50% emission reduction will be achieved by 2020, and a 75% emission reduction by 2025.

**NPS Organic Act and Management Policies.** The National Park Service Organic Act (16 USC 1, et seq.) and the National Park Service *Management Policies 2001* guide the protection of park and wilderness areas. The general mandates of the Organic Act state that the National Park Service will

promote and regulate the use of . . . national parks . . . by such means and measures as conform to the fundamental purpose of the said parks, . . . which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations (16 USC 1).

Under its *Management Policies 2001* the National Park Service will

seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas (*NPS Management Policies*).

The *Management Policies* further state that the National Park Service will assume an aggressive role in promoting and pursuing measures to protect air quality related values from the adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential air pollution on park resources, the National Park Service "will err on the side of protecting air quality and related values for future generations."

The Organic Act and the *Management Policies* apply equally to all areas of the national park system, regardless of Clean Air Act designation. Therefore, the National Park Service will protect resources at both class I and class II designated units. Furthermore, the Organic Act and the *Management Policies* provide additional protection beyond that afforded by the Clean Air Act's national ambient air quality standards alone because the National Park Service has documented that specific park air quality

related values can be adversely affected at levels below the national standards or by pollutants for which no standard exists.

## **METHODOLOGY AND ASSUMPTIONS**

To assess the level of PWC air quality impacts resulting from a given management alternative, the following methods and assumptions were used:

1. The national ambient air quality standards and state/local air quality standards (if applicable) were examined for each pollutant.
2. Air quality designations for the surrounding area were determined. If a park, or a portion of a park, was within the boundaries of a nonattainment or maintenance area for a given pollutant, ambient air quality concentrations were assumed to violate the national ambient air quality standards for that pollutant. Assateague Island National Seashore and the nearby areas are in attainment for all criteria pollutants.
3. Local ambient air quality data from monitoring sites within the park, if available, and from monitoring sites nearby (within 100 miles) were reviewed. The occurrence of any exceedances (where applicable) and the level and frequency of pollutant concentrations were ascertained. If local ambient air quality data were not available, short-term sampling was conducted to assess current air quality conditions, or current conditions were assessed from regional interpolations. For each pollutant evaluated, the first highest maximum concentration obtained was compared with the national ambient air quality standards.
4. The use of motorized watercraft (both number of visits and hours of operation) at the park was determined from visitation records, launching permits, seasonal observations by park personnel, and state aerial surveys. The annual number of hours of use by each watercraft type was calculated by multiplying the number of visits by the hours of operation. Peak hours of use were estimated assuming that on a high-use day all personal watercraft would operate at the same time.
5. The rated horsepower, average engine load, deterioration factors, and other relevant parameters for each watercraft type were taken from the EPA NONROAD model. (This model is used to calculate emissions of criteria pollutants from operation of nonroad spark-ignition type engines, including personal watercraft. The model allows assumptions to be made regarding the mix of engine types that will be phased in as new engine standards come into effect and increasing numbers of personal watercraft will be of the cleaner burning four-stroke type. Total hydrocarbon emissions comprise approximately 100% of the VOC for two-stroke engines and 93% of the VOC for four-stroke engines [US EPA 1997; US EPA 2000].)
6. Any reductions in emissions resulting from implementing control strategies were taken into account, as were changes in emissions resulting from increased or decreased usage.
7. Studies regarding ozone injury on sensitive plants found in the park were reviewed.
8. A calculation referred to as SUM06 (ppm-hr) was used for ozone. The highest three-month, five-year average commonly used for the area was determined by reviewing ambient air quality data (available from the NPS Air Resources Division).
9. Visibility impairment was determined from local monitoring data, or from qualitative evidence such as personal observations and photographs.
10. The air quality impacts of the various alternatives were assessed by considering the existing air quality levels and the air quality related values present, and by using the estimated

emissions and any applicable, EPA-approved air quality models. Estimated reductions in hydrocarbon emissions assumed a 25% reduction by 2005 from personal watercraft. A further reduction for each year thereafter assumed a reduction of 1.5% per year. Estimated reductions in hydrocarbon emissions would be the same as those described for water quality.

11. Cumulative impacts were analyzed qualitatively, with consideration given to boat and PWC air emissions. Although Assateague Island National Seashore does maintain vehicular access to the park that is open to cars, trucks, and recreational vehicles, emissions from these vehicles were not assessed.

PWC impact thresholds for air quality are dependent on the type of pollutants produced, the background air quality, and the pollution-sensitive resources (air quality related values) present. Impact thresholds may be qualitative (e.g., photos of degraded visibility) or quantitative (e.g., based on impacts to air quality related values or federal air quality standards, or emissions based), depending on what type of information is appropriate or available.

Two categories of potential airborne pollution impacts from PWC are analyzed: (1) impacts on human health, and (2) impacts on air quality related values in the park area. Thresholds for each impact category (negligible, minor, moderate, and major) are discussed below.

## STUDY AREA

The study area includes the immediate locations of PWC use and the surrounding nearshore environment where air pollutants may accumulate. For purposes of this review, the study area is Assateague Island National Seashore from Ocean City Inlet to Chincoteague Inlet.

## IMPACT TO HUMAN HEALTH FROM AIRBORNE POLLUTANTS RELATED TO PWC USE

Assateague Island National Seashore is an attainment area for all monitored pollutants. Areas are designated as in attainment if national ambient air quality standards are met for all pollutants monitored. The following impact thresholds have been defined:

	<u>Activity Analyzed</u>		<u>Current Air Quality</u>
<i>Negligible:</i>	Emissions levels are less than 50 tons/year for each pollutant.	<b>and</b>	The first highest 3-year maximum for each pollutant is less than NAAQS.
<i>Minor:</i>	Emissions levels are less than 100 tons/year for each pollutant.	<b>and</b>	The first highest 3-year maximum for each pollutant is less than NAAQS.
<i>Moderate:</i>	Emissions levels are greater than or equal to 100 tons/year for any pollutant.	<b>or</b>	The first highest 3-year maximum for each pollutant is greater than NAAQS.
<i>Major:</i>	Emissions levels are greater than or equal to 250 tons/year for any pollutant.	<b>and</b>	The first highest 3-year maximum for each pollutant is greater than NAAQS.

*Impairment:* Air emissions would contribute to continued violation of national standards. In addition, impacts would:

have a major adverse effect on park resources and values;

contribute to deterioration of the park's air quality to the extent the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's general management plan or other park planning documents.

### **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** Under alternative A the number of personal watercraft in all areas of the national seashore are projected to increase from 15.2 craft per hour in 2002 to 17.7 per hour by 2012. The ambient air quality levels in the study area meets the national ambient air quality standards and would continue to be in attainment under alternative A. Table 25 presents the annual PWC emission loads and their impact levels for 2002 and 2012. The air quality impact levels would be minor for CO since the PWC emission levels would be between 50 and 100 tons/year, while all other pollutant levels would be negligible since these PWC emission levels would be less than 50 tons/year.

**TABLE 25: PWC EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE A**

	CO		PM		HC		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	64.46	61.91	1.32	0.25	28.40	18.64	33.58	19.94
Impact Level (adverse)	Minor	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

**Cumulative Impacts.** A variety of sources of hydrocarbons can be found in the vicinity of the study area, especially in and around the Ocean City Inlet near the northern landing area. These include other boats, automobiles, RVs, and other motor vehicles. According to visitor surveys, the current average numbers of all boats used at the three locations within the seashore are 56 per hour in the Ocean City Inlet, 15 per hour in Sinepuxent Bay, and 5 per hour in the Little Beach area; while the current hourly use of the personal watercraft at these locations are 8.1, 5.1, and 2 per hour, respectively (University of Delaware 2002; NPS 2000d). The number of watercraft, excluding PWC found within the project area were estimated to range from 61 boats per hour (2000) and 71.8 boats per hour (2012). The size of these boats would vary from small 16-foot watercraft to 50-foot or longer fishing and performance boats. Most of the smaller rental boats operate two-stroke gasoline outboard engines with power ratings from 15 to 130 horsepower (hp), or between 11 and 96 kW (OC Bayside Rentals staff, pers. comm., Sept. 13, 2001). The larger performance boats used for tours operate on a 3196 Caterpillar inboard diesel with a power rating between 340 to 660 hp or on a 90 hp four-stroke outboard diesel engine (OC Rocket and the Assateague Adventure, Ocean City Boats, pers. comm., Sept. 13, 2001). Unlike the northern landing area, the boat activity in the southern landing area (other than personal watercraft) consists of windsurfers, kayaks, canoes, and small sailboats. In general, the area tends to be too shallow for larger, motorized boats (W. Bowman, NPS, pers. comm., Sept. 13, 2001). These types of activities in the southern landing area tend to generate negligible air emissions.



Considering the average national trend of the marine vehicles use, and the current and future emission levels generated at the project locations, the cumulative emissions and impacts of all boating activities under alternative A are predicted and presented in Table 26. Under alternative A the cumulative emission levels for CO would be moderate for 2002 and 2012; while levels for HC and VOC would be minor to negligible, and the cumulative emission level for PM would be negligible. In 2012 the cumulative emission levels would be decreased due to cleaner boating emissions resulting from required technological improvements.

**TABLE 26: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE A**

	CO		PM		HC		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	155.39	147.51	3.18	0.62	68.47	44.42	80.96	47.51
Impact Level (adverse)	Moderate	Moderate	Negligible	Negligible	Minor	Negligible	Minor	Negligible

**Conclusion.** PWC use would continue at existing levels within the national seashore boundary. Alternative A would result in minor adverse impacts for CO and negligible adverse impacts for other pollutants, due to continued PWC use and the resulting emissions released at the sites.

Overall, emissions from all boating activities under this alternative would result in moderate adverse impacts for CO, and negligible to minor adverse impacts for other pollutants.

This alternative would not result in an impairment of the air quality resource.

### **Impacts of Alternative B — Continue PWC Use under a Special Regulation, But Limit Area of Use**

**Analysis.** Alternative B, like alternative A, would allow PWC use at the northern and southern landing areas; however, PWC use in Sinepuxent Bay would be prohibited. Under this alternative 10.1 PWC users per hour would be present within the national seashore during daylight hours, increasing to 11.8 by 2012.

In 2002 PWC emission levels would be negligible for all criteria pollutants. Under alternative B the ambient air quality levels in the study area would meet the national ambient air quality standards, and the area would continue to be in attainment. This alternative would not change the regional air quality in the area. Expected PWC emissions for each pollutant by 2012 would be less than 50 tons per year, as shown in Table 27. The adverse air quality impact levels in 2012 would be negligible for all pollutants since the PWC emission levels would be less than 50 tons/year.

**TABLE 27: PWC EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE B**

	CO		PM		HC		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	48.35	39.10	0.99	0.16	21.30	11.77	25.19	12.59
Impact Level (adverse)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

**Cumulative Impacts.** Cumulative impacts would be similar to those described under alternative A except that PWC use would be banned within the national seashore boundary in Sinepuxent Bay, but other types of watercraft would still be permitted, and other sources of hydrocarbons would be present

in the area. Considering the average national trends for boat and PWC use, and the current and future emission levels generated at the project locations, the cumulative impacts of all activities under alternative B are presented in Table 28. Under alternative B the cumulative emission levels for CO would be moderate for 2002 and 2012. The levels for HC and VOC would be minor in 2002, decreasing to negligible in 2012, and the cumulative emission level for PM would be negligible.

**TABLE 28: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE B**

	CO		PM		HC		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	139.28	124.70	2.85	0.52	61.37	37.55	72.56	40.16
Impact Level (adverse)	Moderate	Moderate	Negligible	Negligible	Minor	Negligible	Minor	Negligible

**Conclusion.** The PWC annual emissions for 2002 show that alternative B would result in minor adverse impacts for CO and negligible adverse impacts for the other pollutants of concern. By 2012 impact levels from PWC use would be negligible.

The cumulative impacts from all boating activities under this alternative would result in moderate adverse impacts for CO, and negligible to minor adverse impacts for the other pollutants throughout the assessment period.

Implementation of this alternative would not result in an impairment of the air quality resource.

#### **Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Limit Area of Use and Implement Other Management Restrictions**

**Analysis.** PWC use under alternative C would be limited to the two landing areas in the northern and southern ends of the island, but PWC operators would also have to travel at no-wake speeds when accessing these landing areas. This restriction would limit the use of PWC as a recreational vehicle in this area and encourage its use only as a means of transportation. The proposed management restriction under this alternative would reduce emission levels (compared to alternative B) due to limits on allowable PWC speeds.

Under alternative C the national ambient air quality standards would be met and the project area would continue to be in attainment. Throughout the assessment period PWC emission levels would be negligible adverse for all pollutants since the expected emissions would be less than 50 tons/year. Table 29 summarizes these annual PWC emission loads and their impact levels.

**TABLE 29: PWC EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE C**

	CO		PM		HC		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	4.83	3.91	0.10	0.02	2.13	1.18	2.52	1.26
Impact Level (adverse)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

**Cumulative Impacts.** Considering the average national trend of marine vehicles use, and the current and future emission levels generated at the project locations, predicted cumulative emissions and impacts of all boating activities under alternative C are presented in Table 30.

Under this alternative the cumulative emission levels for CO would be minor adverse from 2002 through 2012. Levels for the other criteria pollutants would be negligible.

**TABLE 30: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE C**

	CO		PM		HC		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	95.77	89.51	1.96	0.38	42.20	26.95	49.89	28.83
Impact Level (adverse)	Minor	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Notes: The analysis summarizes the cumulative impacts of two-stroke motorboats (92% of all watercraft present in the study area). A conservative approach was adopted by assuming that all two-stroke motorboats larger than 16 feet have emission rates similar to those of personal watercraft.

**Conclusion.** PWC annual emissions under alternative C would result in negligible adverse impacts for all criteria pollutants throughout the assessment period.

On a cumulative basis alternative C would result in minor adverse impacts for CO in 2002 and 2012 and negligible adverse impacts for the other criteria pollutants, due to continued PWC use and emissions released at use sites. The proposed management restriction under this alternative would reduce emission levels due to limits in allowable PWC speeds at the southern landing area beyond state regulations.

Implementation of this alternative would not result in an impairment of the air quality resource.

### Impacts of the No-Action Alternative

**Analysis.** No emissions would be emitted by personal watercraft under this alternative within the national seashore boundary.

The implementation of the no-action alternative would result in short- and long-term beneficial impacts in the future with no PWC emissions released. By 2012 ambient air quality would be improved and would continue to meet national ambient air quality standards.

**Cumulative Impacts.** The cumulative air quality impacts of all marine vehicles and boating activities under the no-action alternative are analyzed and summarized in Table 31. There would be no cumulative effects of PWC use since under this alternative, PWC use would no longer be operating within the national seashore boundary. However, other emissions would continue.

Overall, the cumulative emission levels for CO would be minor from 2002 through 2012, while levels for HC, VOC, and PM emission levels would be negligible throughout this period.

**TABLE 31: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, NO-ACTION ALTERNATIVE**

	CO		PM		HC		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	90.93	85.60	1.86	0.36	40.07	25.77	47.37	27.57
Impact Level (adverse)	Minor	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

**Conclusion.** The no-action alternative would have negligible beneficial impacts on air quality because PWC would be banned from the seashore.

The cumulative impacts from all boating activities would be decreased due to less PWC operation and cleaner engine emissions, but would still result in minor impacts for CO and negligible impacts for other pollutants.

Implementation of this alternative would not result in an impairment of the air quality resource.

#### IMPACT TO AIR QUALITY RELATED VALUES FROM PWC POLLUTANTS

Impacts to air quality related values include visibility and biological resources (specifically ozone effects on plants) from airborne pollutants related to PWC use ( $O_3$ ,  $NO_x$ , THC, PM). PM-2.5 as a fraction of particulate matter (PM) is evaluated for visibility impairment. Both VOC and  $NO_x$  are ozone precursors and are evaluated separately in lieu of ozone, which is formed secondarily.

To assess the impact of ozone on plants, the five-year ozone index value was calculated and is represented as SUM06. National SUM06 values have been developed by the Air Resources Division of the National Park Service, based on rural and urban monitoring sites.

The following PWC impact levels for air quality related values are assumed:

	<u>Activity Analyzed</u>		<u>Current Air Quality</u>
<i>Negligible:</i>	Emissions would be less than 50 tons/year for each pollutant.	<b>and</b>	There would be no perceptible visibility impacts (photos or anecdotal evidence).
			<b>and</b>
			There would be no observed ozone injury on plants.
			<b>and</b>
			SUM06 ozone would be less than 12 ppm-hrs.
<i>Minor:</i>	Emissions would be less than 100 tons/year for each pollutant.	<b>and</b>	SUM06 ozone would be less than 15 ppm-hrs.
<i>Moderate:</i>	Emissions would be 100–249 tons/year for any pollutant.	<b>or</b>	Ozone injury symptoms would be identifiable on plants.
	<b>or</b>		<b>and</b>
	Visibility impacts from cumulative PWC emissions would be likely (based on past visual observations).		SUM06 ozone would be less than 25 ppm-hrs.
<i>Major:</i>	Emissions would be equal to or greater than 250 tons/year for any pollutant).	<b>and</b>	Ozone injury symptoms would be identifiable on plants.
	<b>or</b>		<b>or</b>
	Visibility impacts from cumulative PWC emissions would be likely (based on modeling or monitoring).		SUM06 ozone would be greater than 25 ppm-hrs.

**Impairment:** Air quality related values in the park would be adversely affected. In addition, impacts would:

- have a major adverse effect on park resources and values;
- contribute to deterioration of the park's air quality to the extent the park's purpose could not be fulfilled as established in its enabling legislation;
- affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or
- affect the resource whose conservation is identified as a goal in the park's general management plan or other park planning documents.

### Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

**Analysis.** Under this alternative the ambient air quality levels in the study area would meet the national ambient air quality standards, and the area would continue to be in attainment. Table 32 presents the annual PWC emission loads and their impact levels for 2002 and 2012. The adverse air quality impact levels would be negligible for all pollutants since the PWC emission levels would all be below 50 tons/year. The SUM06 for the study area would be less than 12.

**TABLE 32: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE A**

	VOC		NOx		HC		PM	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	33.58	19.94	0.30	1.12	28.40	18.64	1.32	0.26
Impact Level (adverse)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

**Cumulative Impacts.** The cumulative impact analysis includes all other marine vehicle use, taking into consideration national use trends, as well as current and future emission levels. Effects on visibility, wildlife, and plants due to airborne pollutants were considered. Cumulative emissions and impacts of all personal watercraft and other boating activities under alternative A are shown in Table 33.

The cumulative impact levels from air emissions of all activities under this alternative would be negligible adverse for NOx and PM, and minor adverse for VOC and HC in 2002. By 2012 emission levels would decrease to negligible due to EPA requirements.

**TABLE 33: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE A**

	VOC		NOx		HC		PM	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	80.96	47.51	0.72	2.66	68.47	44.42	3.18	0.62
Impact Level (adverse)	Minor	Negligible	Negligible	Negligible	Minor	Negligible	Negligible	Negligible

**Conclusion.** PWC annual emissions under alternative A would result in negligible adverse impacts for all pollutants. Currently, there is no perceptible qualitative visibility impacts or observed ozone injury to plants. The PWC impact levels on visibility under this alternative would be negligible.

The cumulative impacts from all boating activities would result in negligible to minor adverse impacts to the related values of visibility, wildlife, and plants. Impacts would decrease to negligible for all pollutants by 2012.

Implementation of this alternative would not result in an impairment of air quality related values.

### **Impacts of Alternative B — Continue PWC Use under a Special Regulation, But Limit Area of Use**

**Analysis.** Under this alternative the ambient air quality levels in the study area would meet the national ambient air quality standards and continue to be in attainment. There would be no perceptible qualitative visibility impacts or observed ozone injury on plants.

Table 34 presents the annual PWC emission loads and their impact levels for 2002 and 2012. The adverse air quality impact levels would be negligible for all pollutants since the PWC emission levels would all be below 50 tons/year. The SUM06 for the study area would be less than 12. Future emission levels would also be lower than those levels under the alternative A due to the restriction on PWC use.

**TABLE 34: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE B**

	VOC		NOx		HC		PM	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	25.19	12.59	0.22	0.70	21.30	11.77	0.99	0.16
Impact Level (adverse)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

**Cumulative Impacts.** Cumulative emissions and impacts of all motorized watercraft under alternative B are summarized in Table 35. The impact levels from air emissions of all activities would be negligible adverse for NOx and PM throughout the assessment period, and minor for VOC and HC, becoming negligible by 2012.

**TABLE 35: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE B**

	VOC		NOx		HC		PM	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	72.56	40.16	0.65	2.25	61.37	37.55	2.85	0.52
Impact Level (adverse)	Minor	Negligible	Negligible	Negligible	Minor	Negligible	Negligible	Negligible

**Conclusion.** PWC annual emissions under alternative B would result in negligible adverse impacts for all pollutants. Currently, there are no perceptible qualitative visibility impacts or observed ozone injury on plants. PWC impact levels on visibility, wildlife, and plants from airborne pollutants related to PWC use would be negligible.

The cumulative impacts from all PWC and other marine boating activities in 2002 would result in negligible to minor adverse impacts on related values including visibility, wildlife, and plants. By 2012 impacts would be negligible for all pollutants.

Implementation of this alternative would not result in an impairment of air quality related values.

### Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Limit Area of Use and Implement Other Management Restrictions

**Analysis.** Alternative C would allow PWC use only at the two landing areas in the northern and southern ends of the island; in addition, PWC operators would have to travel at no-wake speeds when accessing these landing points. This restriction would effectively limit the recreational use of personal watercraft and encourage their use as a means of transportation. The proposed management restriction under this alternative would reduce emission levels (compared to alternative B) due to limits on allowable PWC speeds. Consequently, ambient air quality would be improved.

Under this alternative the ambient air quality levels in the study area would meet the national ambient air quality standards and continue to be in attainment. Table 36 presents the annual PWC emission loads and their impact levels for 2002 and 2012. The adverse air quality impact levels would be negligible for all pollutants since the PWC emission levels would all be below 50 tons/year in 2002 and 2012. The SUM06 reading for the study area would be less than 12.

**TABLE 36: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE C**

	VOC		NOx		HC		PM	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	2.52	1.26	0.02	0.07	2.13	1.18	0.10	0.02
Impact Level (adverse)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

**Cumulative Impacts.** The cumulative emissions and impacts of all PWC and other boating activities are shown in Table 37. The cumulative impact levels from air emissions of all activities under this alternative would be negligible to minor adverse for VOC and HC in 2002, decreasing to negligible by 2012; impacts would be negligible for NOx and PM throughout the assessment period.

**TABLE 37: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE C**

	VOC		NOx		HC		PM	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	49.89	28.83	0.44	1.61	42.20	26.95	1.96	0.38
Impact Level (adverse)	Negligible	Negligible	Negligible	Negligible	Minor	Negligible	Negligible	Negligible

Notes: The analysis summarizes the cumulative impacts of two-stroke motorboats (92% of all watercraft present in the study area). A conservative approach was adopted by assuming that all two-stroke motorboats larger than 16 feet have emission rates similar to those of personal watercraft.

**Conclusion.** PWC annual emissions under alternative C would result in negligible adverse impacts for all pollutants for 2002 and 2012. Currently, there is no perceptible qualitative visibility impacts or observed ozone injury on plants. Impacts on visibility and plants from PWC emissions under this alternative would be negligible.

The cumulative impacts of all motorized marine boating activities would result in negligible impacts on related resources including visibility, wildlife, and plants throughout the assessment period.

Implementation of this alternative would not result in an impairment of air quality related values.

## Impacts of the No-Action Alternative

**Analysis.** Under the no-action alternative PWC use within national seashore boundaries would be terminated. As a result, PWC-related impacts on plants, soil, and water would be a long-term, negligible beneficial impact. The area would continue to meet the national ambient air quality standards. Currently, there is no perceptible qualitative visibility impacts or observed ozone injury on plants. The PWC impact levels on visibility under no-action alternative would be negligible.

**Cumulative Impacts.** While PWC use would be no longer allowed within the national seashore, other motorized marine vehicles would continue at the same use levels. The total cumulative emission loads and impact levels are presented in Table 38. The cumulative impact levels from air emissions of all activities under the no-action alternative would be negligible for all pollutants throughout the assessment period. Future emission levels would decrease due to the cleaner engine regulations, resulting in negligible adverse impacts.

**TABLE 38: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, NO-ACTION ALTERNATIVE**

	VOC		NOx		HC		PM	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	47.37	27.57	0.42	1.54	40.07	25.77	1.86	0.36
Impact Level (adverse)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

**Conclusion.** Implementation of the no-action alternative would have beneficial impacts on air quality of the Assateague Island National Seashore because PWC use would be banned within the national seashore boundary.

Impacts to visibility, wildlife, and plants from airborne pollutants related to all other boating activities would be negligible.

Implementation of this alternative would not result in an impairment of air quality related values.

## SOUNDSCAPES

All motorized watercraft, including PWC, produce noise that may impact park soundscapes and visitor experiences. Any watercraft that does not meet the NPS watercraft noise regulation of 82 dB at 82 feet at full acceleration is subject to fine and removal from the park. Therefore, it is assumed for this analysis that 82 dB at 82 feet is the maximum that would be emitted for any legal watercraft at full acceleration (normally the “loudest” portion of its operation).

In addition, the noise from personal watercraft may be more noticeable and therefore more impacting to people than other motorcraft due to frequent changes in acceleration and direction, and jumping into the air, causing rapid increases in the noise level and changes in sound frequency distribution.

## GUIDING REGULATIONS AND POLICIES

The national park system includes some of the quietest places on earth, as well as a rich variety of sounds intrinsic to park environments. These intrinsic sounds are recognized and valued as a park



resource in keeping with the NPS mission (ref. *NPS Management Policies*, 2001, Section 1.4.6), and are referred to as the park's natural soundscape. The natural soundscape, sometimes called natural quiet, is the aggregate of all the natural sounds that occur in parks, absent human-caused sound, together with the physical capacity for transmitting the natural sounds (ref. Sec. 4.9). It includes all of the sounds of nature, including such "non-quiet" sounds as birds calling, thunder, and waves breaking against the shore. Some natural sounds are also part of the biological or other physical resource components of parks (e.g., animal communication, sounds produced by physical processes such as wind in trees, thunder, waves).

NPS policy requires restoration of degraded soundscapes to the natural condition whenever possible, and protection of natural soundscapes from degradation due to noise (undesirable human-caused sound) (*Management Policies 2001*, sec. 4.9). The National Park Service is specifically directed to "take action to prevent or minimize all noise that, through frequency, magnitude, or duration, adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified as being acceptable to, or appropriate for, visitor uses at the sites being monitored" (*Management Policies 2001*, sec. 4.9). Overriding all of this is the fundamental purpose of the national park system, established in law (e.g., 16 USC 1 et seq.), which is to conserve park resources and values (*Management Policies 2001*, sec. 1.4.3). NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values (*Management Policies 2001*, sec 1.4.3).

Noise can adversely affect park resources, including but not limited to natural soundscapes. It can directly impact them, for example by modifying or intruding upon the natural soundscape. It can also indirectly impact resources, for example by interfering with sounds important for animal communication, navigation, mating, nurturing, predation, and foraging functions.

Noise can also adversely impact park visitor experiences. The term "visitor experience" can be defined as the opportunity for visitors to experience a park's resources and values in a manner appropriate to the park's purpose and significance, and appropriate to the resource protection goals for a specific area or management zone within that park.

The federal regulation pertaining to noise abatement for boating and water use activities (36 CFR 3.7) prohibits operating a vessel on inland waters "so as to exceed a noise level of 82 decibels measured at a distance of 82 feet (25 meters) from the vessel" and specifies that testing procedures to determine such noise levels should be in accordance with or exceed those established by the Society of Automotive Engineers (SAE) in "Exterior Sound Level Measurement Procedure for Pleasure Motorboats" (J34). This SAE procedure specifies that sound level measurements be taken 25 meters perpendicular to the line of travel of the vessel at full throttle (SAE 2001). It is important to note that this NPS regulation and the SAE procedure were developed for enforcement purposes, not impact assessment purposes. The level in the regulation does not imply that there are no impacts to park resources or visitor experiences at levels below 82 dB; it just indicates that noise levels from vessels legally operating on NPS waters will be no "louder" than 82 dB. As explained elsewhere in this document, a single decibel value does not provide much information for impact assessment purposes.

NPS policy requires restoration of degraded soundscapes to the natural condition whenever possible, and protection of natural soundscapes from degradation due to noise (undesirable human-caused sound) (*Management Policies 2001*, sec. 4.9). The NPS is specifically directed to "take action to prevent or minimize all noise that, through frequency, magnitude, or duration, adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified as being acceptable to, or appropriate for, visitor uses at the sites being monitored." Overriding all of this

is the fundamental purpose of the national park system, established in law (e.g., 16 USC 1 et seq.), which is to conserve park resources and values (*Management Policies 2001*, sec. 1.4.3). NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values (*Management Policies 2001*, sec 1.4.3).

Human-generated noise sources at Assateague Island National Seashore include personal watercraft and many other types of watercraft, land vehicles, aircraft, and activities related to development in Ocean City adjacent to the inlet.

## METHODOLOGY AND ASSUMPTIONS

The methodology used to assess noise impacts from PWC in this document is consistent with the NPS *Management Policies 2001*, and *Director's Order #47: Soundscape Preservation and Noise Management*, and the reference manual for DO #47. Park-specific factors related to context, time, and intensity are discussed below, and then integrated into a discussion of the impact thresholds used in this analysis.

Potential impacts to the soundscape at Assateague Island National Seashore were evaluated based on the existing sound levels in comparison to potential sound levels associated with each of the alternatives. This evaluation is a qualitative assessment. The qualitative assessment is based on the general trends of existing and future PWC use in the park and best professional judgment. While specific background noise studies are not available at Assateague Island National Seashore, certain conditions have been taken into account given the number of PWC users in the identified landing areas and land use patterns surrounding those areas. It is assumed that the soundscape at the northern landing area in the proximity of Ocean City is that of an active urban area, while the southern landing area is more characteristic of a quiet rural town area with associated tourism. Impacts to wildlife from noise are addressed separately under Wildlife and Wildlife Habitat.

**Context:** Assateague Island National Seashore includes areas characterized by intense motorized boat activity (the Ocean City Inlet) and areas characterized by bird watching, canoeing, hiking, and camping. Resources at the seashore that are most likely to be affected by PWC noise include the park's natural and noise-sensitive wildlife, such as breeding waterfowl.

The primary issue relative to PWC use is that other visitors may perceive the sound made by personal watercraft as an intrusion or nuisance, thereby disrupting their experiences. This is generally on a short-term basis as personal watercraft travel from the shore to outlying areas. However, as PWC use increases and begins to concentrate in an area, related noise becomes more of an issue, particularly during certain times of the day (e.g., at sunset or sunrise when other visitors may be camping on the shore).

Assateague Island National Seashore visitor experiences most likely to be affected by PWC noise include opportunities to experience the park's natural soundscape unaffected by human noise at the southern end of the island and within Sinepuxent Bay. People in parties associated with PWC use may not be adversely affected, while people not associated with PWC use, even if they are associated with other types of motorized boat activity, may consider PWC use intrusive. For those who use a boat primarily as a means of transport and then moor their boat to enjoy the destination site in relative isolation, PWC use by another party may adversely affect their experience.

Congress established Assateague Island National Seashore "for the purpose of protecting and developing Assateague Island in the States of Maryland and Virginia and certain adjacent

waters and small marsh islands for public outdoor recreation use and enjoyment” (16 USC 459f). Consequently, some sound produced by recreational activities is acknowledged.

**Time Factor:** PWC use occurs during all seasons except winter. PWC use occurs primarily during daylight hours. Use generally discontinues during periods of inclement weather (*e.g.*, cold, thunderstorms). Time periods of greater sensitivity to noise impacts include sunset, sunrise, and night times when visitors are in camp.

In areas of concentrated PWC use, such as the Ocean City Inlet, noise from PWC and other boats can be virtually constant from sunrise to sunset. In areas of low use, noise from PWC and other boat types can be intermittent usually lasting at least a few minutes when present.

**Intensity:** The levels of sound generated by watercraft using the national seashore area is expected to affect recreation users differently. For example, visitors participating in less sound-intrusive activities such as bird watching and/or hiking would likely be more adversely affected by PWC noise than another PWC or motorboat user. Therefore, impacts to soundscape must take into account the effect of noise levels on different types of recreation users within the study area. The following is a list of other considerations for evaluating sound impacts:

The maximum number of PWC operating per hour would increase from 8 in 2002 to 9 by 2012 in the Ocean City Inlet, from 5 to 6 in Sinepuxent Bay, and would remain at 2 in the Little Beach area. These are considered to be the maximum numbers during peak season around midday when use is highest.

PWC operations within 100 feet of the shore are at no-wake speed in Maryland.

Ambient noise levels at the northern landing area include natural sounds (wind and waves), other visitors, noise from Ocean City, and other boats. Boats in this vicinity of the northern landing area outnumber PWC 6 to 1.

Ambient noise levels at Sinepuxent Bay and Little Beach include natural sounds, other visitors, and other boats. Noise at Sinepuxent Bay includes traffic over the SR 611 Bridge (which it may be high during the summer months). Boats outnumber PWC 2 to 1 in the Sinepuxent Bay area and typically comprise the majority in the Little Beach area.

In order to estimate the relative impacts of PWC use at the park, the following methodology was followed:

1. PWC use was estimated as explained in PWC Use Trends. National literature was used to estimate the average decibel levels of PWC. Literature sources included federal and state agencies, PWC industry specifications, and measurements conducted by various non-governmental organizations.
2. Areas of shoreline use by other visitors were identified in relation to where PWC launch and operate offshore. Personal observation from park staff, aerial surveys, and mail in surveys conducted by the Maryland Department of Natural Resources and the University of Delaware, were used to estimate the number of personal watercraft relative to other watercraft (see PWC User Trends).
3. Personal observations from park staff were used to identify areas of use, as well as estimates of numbers of personal watercraft and timeframes of use (morning, afternoon, evening, etc.) (see PWC User Trends).
4. Other considerations, such as topography, vegetation, prevailing winds, other noise sources, etc. were then used to identify areas where PWC noise levels may be exacerbated, or reduced.

5. In this assessment the equation used to calculate the noise of two or more personal watercraft operating at the same time (when one unit produces 82 dB), and at a distance of 82 feet from the source, was

$$10 \times \log((10^{82/10}) + (10^{82/10})) = 85 \text{ dB.}$$

Consequently, the noise calculated for the study area, and based on PWC average numbers per hour estimated in the user trend section of this report, would be

Ocean City Inlet (8 PWC / hour) = 91 dB

Sinepuxent Bay (5 PWC / hour) = 89 dB

Little Beach (2 PWC / hour) = 85 dB

The following equation was used to calculate noise levels at a given distance from shore:

$$20 \times \log (D1/D2)$$

where, D1 = the location to be calculated

D2 = the distance of the known noise source

Consequently, for a distance of 100 feet from the source (wake-zone areas in Maryland waters), the estimated noise levels for the study areas would be:

Ocean City Inlet (8 PWC / hour) = 89.3 dB

Sinepuxent Bay (5 PWC / hour) = 87.3 dB

Little Beach (2 PWC / hour) = 83.3 dB

## STUDY AREA

The study area for soundscapes is related to the location that PWC operate and the distance that PWC noise travels. PWC are allowed to operate within the three designated areas: the Ocean City Inlet landing area, Sinepuxent Bay, and the Little Beach landing area. PWC noise can travel inland, and is expected to dissipate significantly within 0.75 miles of the source. Thus, the study area for soundscapes is Assateague Island National Seashore's northern end from the Ocean City Inlet to the SR 611 bridge and from Little Beach inland 0.75 mile.

## IMPACT TO VISITORS FROM NOISE GENERATED BY PWC

Given this methodology and the accompanying assumptions, the following criteria have been developed to assess the noise impacts for each of the alternatives:

*Negligible:* Natural sounds would prevail; motorized noise would be very infrequent or absent, mostly immeasurable.

*Minor:* Natural sounds would predominate in areas where management objectives call for natural processes to predominate, with motorized noise infrequent at low levels. In areas where motorized noise is consistent with park purpose and objectives, motorized noise could be heard frequently throughout the day at moderate levels, or infrequently at higher levels, and natural sounds could be heard occasionally.

*Moderate:* In areas where management objectives call for natural processes to predominate, natural sounds would predominate, but motorized noise could occasionally be present at low to moderate levels. In areas where motorized noise is consistent with park purpose and objectives, motorized noise would predominate during daylight hours and would not be overly disruptive to noise-sensitive visitor activities in the area; in such areas, natural sounds could still be heard occasionally.

*Major:* In areas where management objectives call for natural processes to predominate, natural sounds would be impacted by human noise sources frequently or for extended periods of time at moderate intensity levels (but no more than occasionally at high levels), and in a minority of the area. In areas where motorized noise is consistent with park purpose and zoning, the natural soundscape would be impacted most of the day by motorized noise at low to moderate intensity levels, or more than occasionally at high levels; motorized noise would disrupt conversation for long periods of time and/or make enjoyment of other activities in the area difficult; natural sounds would rarely be heard during the day.

*Impairment:* The level of noise associated with PWC use would be heard consistently and would be readily perceived by other visitors throughout the day, especially in areas where such noise would potentially conflict with the intended use of that area. In addition, these adverse, major impacts (described above) to park resources and values would:

- contribute to deterioration of the park's soundscape to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

- affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

- affect the resource whose conservation is identified as a goal in the park's general management plan or other park planning documents.

### **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** On a typical summer day, there are approximately 8 to 9 PWC present in the vicinity of the northern landing area, 5 to 6 PWC present in the Sinepuxent Bay PWC use area, and 2 present at the Little Beach landing area. Boaters are also present in all three areas; however, the number of boats is much higher at the Ocean City Inlet and the northern landing area. Hikers may be present near the Sinepuxent Bay area and Little Beach. Canoers, kayakers, and fishing enthusiasts may also be present in these areas.

Research conducted by the Izaak Walton League indicates that one PWC unit can emit between 85 and 105 dB of sound. Noise limits established by the National Park Service are 82 dB at 82 feet. On average, at least 2 PWC are present at any of the three landing/PWC areas within the park boundary. Two PWC that emit 82 dB of sound would result in a noise level of 85 dB at 82 feet. At the northern landing area, however, PWC are not allowed to operate above no-wake speed within 100 feet of the shoreline, thus reducing noise levels of 2 PWC below 83 dB with the reduced speeds within 100 feet of the shoreline. Eight PWC present within the park boundary at the northern landing area would generate noise levels of 91 dB at 82 feet.

At Sinepuxent Bay, the PWC use area is at least 200 feet from the shoreline of Assateague Island. Noise levels generated by 5 PWC at 85 dB would reach the island shoreline at 77dB when traveling greater than 200 feet. The majority of the shoreline is a much greater distance from the PWC use area

boundary, however, thus reducing noise levels further. Visitors canoeing, kayaking, or fishing within the park boundary at Sinepuxent Bay would be directly exposed to PWC. Again, however, Maryland boating regulations require PWC not be operated within 100 feet of another vessel, thus reducing noise levels to 83 dB which is still above the National Park Service noise regulation.

Virginia regulations require that PWC operate at no-wake speeds within 50 feet of people in the water or other motorized watercraft and watercraft. At the Little Beach landing area, noise levels generated by two PWC operating within 82 feet of the shoreline would be 89 dB.

For all three designated PWC use areas within the National Park Service boundary, the noise levels recede as the noise travels over dunes, the shoreline, and vegetation. As sound travels inland, the attenuating properties of the terrain and natural vegetation would further reduce noise levels.

The ambient noise levels vary between each PWC use area. Ambient levels at the Ocean City Inlet landing area may reach levels between 70 and 80 dB on a windy day. PWC noise would be diluted by the sounds from wind, waves, Ocean City, other visitors, and watercraft. Sunbathers using the beach at the northwest corner of the island have complained about PWC noise in the area (C. Zimmerman, pers. comm., Oct. 17, 2001, NPS). In general, the use of PWC would result in minor adverse impacts where other users are concentrated in the inlet landing area. At the Ocean City Inlet landing area, PWC noise would be heard throughout the day but ambient sounds are predominant.

Ambient noise levels may be assumed to be lower in Sinepuxent Bay due to loss of wave noise from the oceanside. However, noise from other watercraft in the area would be present as well as sound from traffic on the SR 611 bridge. PWC noise would be diluted prior to reaching the shoreline of Assateague Island National Seashore and would have minor adverse impacts to visitors within the area on shore. PWC noise would have moderate adverse impacts to canoeists, kayakers, and fishing enthusiasts present in Sinepuxent Bay. The 2000 Visitor Survey conducted at Assateague Island National Seashore revealed that 70% of those surveyed are concerned with noise and disturbance in fishing areas by PWC (University of Delaware 2000).

Little Beach may also be assumed to have lower ambient noise levels due to its location away from urban environments. Little Beach is sensitive to noise disturbances due to the abundant bird population in the area. PWC can operate within 50 feet of the shoreline within the Little Beach PWC use area, but fewer PWC frequent the area on average. PWC noise levels generated within the Little Beach area would be 85 dB if 2 PWC were present. PWC noise levels would be expected to have moderate adverse impacts in the area of Little Beach potentially disturbing wildlife.

Overall, noise levels from PWC would be expected to have negligible to moderate adverse impacts at certain locations within the Assateague Island National Seashore boundary. Negligible impacts would occur when PWC use is infrequent, and at great distances from other park users. Minor impacts would occur when noise associated with PWC use is frequent throughout the day but at moderate levels and natural sounds could still be heard occasionally. Moderate impacts would occur when the daytime ambient sound levels are high due to weather, waves, and proximity to urbanized areas and/or when PWC use is below average. Moderate impacts would occur when PWC use conflicts with other recreational uses of the park such as fishing, canoeing, and kayaking in Sinepuxent Bay and/or birdwatching, hiking, and kayaking in the Little Beach area. Overall, implementation of this alternative would result in net negligible to moderate adverse impacts on the soundscape of Assateague Island National Seashore. Impacts are short term, since noise generated by PWC is only generated during the daylight hours during warmer weather. Potential reduction in noise emissions (as forecasted by the industry), may contribute to a reduction of adverse impacts to park visitors.

**Cumulative Impacts.** Other noise sources present at Assateague Island National Seashore include wave action, ocean breeze, Ocean City to the north, traffic crossing the SR 611 bridge, and other boats. Other boating activities within the park are capable of generating noise levels as high as PWC. Near the Ocean City Inlet, boats outnumber PWC present in the area by 6 to 1. Boats are more prevalent in Sinepuxent Bay as well. Boaters access the park by the northern landing area and the southern landing area. Fishing boats and tour boats are also prevalent within the park boundary. The cumulative impacts of boating noise, ambient noise levels, and PWC would continue to range from negligible to moderate, depending on location within the national seashore. The northern landing area in the Ocean City Inlet experiences elevated noise levels due to the presence of Ocean City and the level of boat traffic within the inlet. Impacts to noise levels would continue to be minor with the addition of noise from PWC in the inlet.

Other park users contribute to the soundscape of Assateague Island National Seashore, including beach users, hikers, surfers, four-wheel drive enthusiasts, canoers, and kayakers. However, visitors consider these sounds compatible with park uses. Visitor noise has a negligible adverse impact on the soundscape at Assateague Island National Seashore. All impacts are short-term, present for a limited duration.

**Conclusion.** PWC use would continue to be a minor adverse impact at the northern landing area and a minor to moderate adverse impact at Sinepuxent Bay and Little Beach. Impact levels would be related to the number of PWC operating, as well as the sensitivity of the other visitors and other visitor activities occurring within the area.

The cumulative impacts of boating noise, ambient noise levels, and PWC would continue to range from negligible to moderate, depending on location within the national seashore. Projected increased PWC use levels would not increase the severity of the noise impact and would remain short-term impacts, occurring during daylight hours during the warmer months.

Implementation of this alternative would not result in an impairment of the soundscape.

### **Impacts of Alternative B — Special Regulation to Continue PWC use, but Limit Area of Use**

**Analysis.** This alternative would prohibit PWC use in the Sinepuxent Bay area, while continuing to allow access at the northern and southern landing areas. This restriction would result in an additional reduction of PWC activity within the park boundary, reducing visitor complaints in the area. Impacts at the northern (Ocean City Inlet) and southern landing (Little Beach) areas would be the same as alternative A; however, impacts within the Sinepuxent Bay PWC use area would be reduced to minor short-term adverse impacts resulting from PWC use that may still occur outside the park boundary and other motorized watercraft within the park.

**Cumulative Impacts.** Cumulative impacts would be the same as alternative A, excluding the Sinepuxent Bay area. Noise from PWC and other boats traveling outside of the park boundary would continue to have a minor adverse impact on other recreational users in the Sinepuxent Bay.

**Conclusion.** Removing PWC use from the Sinepuxent Bay area would have a beneficial effect, while impacts at the Ocean City Inlet landing area impacts would be minor, short-term, adverse impacts, and at Little Beach they would be minor to moderate.

Cumulative impacts would be similar to alternative A. Fishing boats, sailboats, canoers, and kayakers frequenting the Sinepuxent Bay area would still experience minor adverse impacts due to PWC and boat noise from outside the national seashore boundary and other boat noise from within the boundary.

Implementation of this alternative would not result in an impairment of the soundscape.

### **Impacts of Alternative C — Special Regulation to Continue PWC use, but Limit Area of Use and Implement Other Management Restrictions**

**Analysis.** Like alternative B, alternative C would allow PWC use only at the two landing areas in the northern and southern ends of the island; however, PWC operators would have to travel at no-wake speeds (maximum 6 mph) when accessing these landing points. No-wake requirements within the national seashore would likely further reduce PWC activity because recreational use would be effectively prohibited. This could reduce visitor complaints in the area. Impacts at the northern (Ocean City Inlet) landing area would continue to be minor adverse. Impacts due to PWC noise at the Little Beach landing areas would be reduced to minor adverse.

Operating a personal watercraft at idle would reduce noise levels farther from the shoreline. Noise reductions at 100 feet from shore would be minimal, ranging between 1.7 to 1.8 dB less than at the source (82 feet).

**Cumulative Impacts.** Cumulative impacts would be the same as alternative B within Sinepuxent Bay. The cumulative adverse impact of boating noise, ambient noise levels, and PWC would continue to range from negligible to minor dependant on location within the park boundary at the Ocean City Inlet. The northern landing area in the Ocean City Inlet experiences elevated noise levels due to the presence of Ocean City and the level of boat traffic within the inlet. Impacts to noise levels would continue to be minor. Noise from PWC and other boats would have a minor adverse impact on other recreational users at Little Beach with the implementation of alternative C. Due to the quiet nature of the area, additional noise above ambient levels would be considered a minor adverse impact.

**Conclusion.** Removing PWC use from the Sinepuxent Bay area would reduce the intensity of adverse impacts in the area to minor, similar to alternative B. Impacts at the Ocean City Inlet landing area and the Little Beach landing area would be reduced from short-term, potentially moderate adverse impacts to short-term, negligible to minor adverse impacts as a result of speed restrictions.

Fishing boats, sailboats, canoers, and kayakers frequenting the Little Beach landing area would still experience negligible adverse impacts due to PWC and boat noise from outside the national seashore boundary and other boat noise from within the boundary.

Implementation of this alternative would not result in an impairment of the resource.

### **Impacts of the No-Action Alternative**

**Analysis.** Discontinuing PWC use within the park would result in negligible beneficial impacts. Visitors to the park would continue to hear boat and PWC noise generated outside the park boundary; however, noise levels would be reduced especially at the southern landing area where boat traffic is less prevalent.



**Cumulative Impacts.** Other boating activity in the park would continue to generate noise. Although PWC generated noise would be eliminated in the long-term from within the park, other boating activity and their noise sources would continue to have negligible to minor adverse impacts with their continued presence within the park boundary. The negligible to minor adverse impacts would be short-term, occurring typically during daylight hours.

**Conclusion.** Prohibiting PWC use within the national seashore would result in a negligible, beneficial impact at the northern landing area due to the variety of ongoing activities and the substantial ambient noise level now. Discontinuing PWC use in Sinepuxent Bay would have the same impact as alternative B. The Little Beach landing area would experience minor, beneficial impacts with the removal of PWC use from that area. The area experiences limited boat traffic currently, so ambient noise levels not produced by natural processes would continue.

Other boating activity and their noise sources would continue to have negligible to minor adverse impacts within the national seashore.

This alternative would not result in impairment of the soundscape.

## **WILDLIFE AND WILDLIFE HABITAT**

Some research suggests that personal watercraft impact wildlife by interrupting normal activities, causing alarm or flight, causing animals to avoid habitat, displacing habitat, and affecting reproductive success. This is thought to be caused by a combination of PWC speed, noise and ability to access sensitive areas, especially in shallow-water-depths. Literature suggests that personal watercraft can access sensitive shorelines, disrupting riparian habitat areas critical to wildlife. New legislation in the state of Maryland has been adopted to protect fragile underwater grasses—House Bill 73. The bill mandates Maryland Department of Natural Resources adopt regulations prohibiting PWC operation above idle speed in water less than 18 inches deep, and authorizes the department to adopt regulations limiting PWC in waters with a depth of less than one meter.

Personal watercraft may have a greater impact on waterfowl and nesting birds because of their noise, speed, and ability to access shallow-water areas more readily than other types of watercraft. This may force nesting birds to abandon eggs during crucial embryo development stages and flush other waterfowl from habitat, causing stress and associated behavior changes. Collisions with waterfowl may also be of concern.

## **GUIDING REGULATIONS AND POLICIES**

The National Park Service *Management Policies 2001* state that National Park Service will maintain as parts of the natural ecosystems of parks all native plants and animals (sec. 4.4.1). The National Park Service will achieve this through (sec. 4.4.1):

- Preserving and restoring the natural abundance, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and communities and ecosystems in which they occur.

- Restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions

Minimizing human impacts on native plants, animal populations, communities, and ecosystems, and the processes that sustain them.

The mission of Assateague Island National Seashore is to “preserve and protect [the] unique coastal resources and the natural ecosystem conditions and processes.” To achieve this, long-term goals at Assateague Island, as stated in the *Strategic Plan*, include the protection, restoration, or maintenance of ecosystems, rare or endangered plant and animal populations. Additional federal, state, and local regulations and/or policies for wildlife and wildlife habitat at Assateague Island are shown in Table 39.

TABLE 39: NPS LAWS AND POLICIES

Laws or Policy	Management Direction
GENERAL—National Park Service	
National Park Service Organic Act National Park Service <i>Management Policies 2001</i>	The National Park Service will “conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”  “National Park Service Obligation to Conserve and Provide for Enjoyment of Park Resources and Values: Congress, recognizing that the enjoyment by future generations of the national parks can be assured only if the superb quality of park resources and values is left unimpaired, has provided that when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant.”  National Park Service management policies acknowledge that providing opportunities for public enjoyment are a fundamental part of the National Park Service mission. But they emphasize that recreational and other activities, including National Park Service management activities, may be allowed only when they will not cause impairment or derogation of a park’s resources, values, or purposes. The sole exception is when an activity that would cause impairment or derogation is specifically mandated by Congress.
Public Law 89-195	On September 21, 1965, Congress established Assateague Island National Seashore to provide a protected enclave for complex plant and animal communities, both terrestrial and aquatic, which characterize the Mid-Atlantic Coast, and fully illustrates the natural processes of change which shape the coastal environment.
Public Law 95-625; 16 USC 1a-7(b)(4)	National Park Service management plans must include measures for protecting the parks’ resources and “indications of potential modifications to the external boundaries of the unit and the reasons therefore.”
NATURAL RESOURCES	
DO #12: <i>Conservation Planning, Environmental Impact Analysis, and Decision-making</i>  NPS <i>Management Policies 2001</i> NPS <i>Natural Resources Management Guideline</i> (DO #77) Endangered Species Act of 1973 Migratory Bird Conservation Act of 1958 Marine Mammal Protection Act of 1972 Title 36 <i>Code of Federal Regulations</i> 1.5, 1.6, 1.10, 2.1, 2.2, 2.3, 2.4, 2.5	These guidelines direct the National Park Service to “encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man and to enrich the understanding of the ecological systems and natural resources important to the Nation . . . .”  Policies and guidelines for natural resources direct that the park must (1) identify and complete the inventories of natural resources for baseline information; (2) minimize impacts of human activities, developments, and uses on marine and terrestrial resources; (3) continue to close areas of the seashore to protect nests; and (4) manage endangered, threatened, and candidate species.  Title 36 CFR provides authorization for closing areas and limiting public use to protect resources; providing public notice of closures or use limits; prohibiting the destruction, defacing, or disturbing of resources; and protecting fish and wildlife and permit research.

Laws or Policy	Management Direction
Executive Order 13158, "Marine Protected Areas"	Passed May 2000, this order helps fulfill the purposes of the National Park Service Organic Act and other pertinent statutes. The purpose of the EO is to, consistent with domestic and international law: (a) strengthen the management, protection, and conservation of existing marine protected areas and establish new or expanded MPAs; (b) develop a scientifically based, comprehensive national system of MPAs representing diverse U.S. marine ecosystems, and the Nation's natural and cultural resources; and (c) avoid causing harm to MPAs through federally conducted, approved, or funded activities (Executive Order 13158, May 26, 2000).
Executive Order 11990, "Protection of Wetlands"	This order requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands.
Executive Order 11988, "Floodplain Management"	This order requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modifications of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.
Public Law 94-265	The Magnuson-Stevens Fishery Conservation and Management Act calls for direct action to stop or reverse the continued loss of fish habitats. Congress mandated the identification of habitats essential to managed species and measures to conserve and enhance this habitat. The Act requires cooperation among National Marine Fisheries Service, the Councils, fishing participants, and federal and state agencies to protect, conserve, and enhance essential fish habitat. Those areas along the Assateague Island National Seashore designated as essential fish habitats are outlined in chapter 3.

Source: Adapted from NPS *Management Policies* 2001.

## PARK MANDATES AND AGREEMENTS

Three public agencies manage specific areas of the island. In Maryland, Assateague State Park (680 acres) is owned and managed by Maryland's Department of Natural Resources. Except for 418 acres of wetland in holdings owned by the U.S. Fish and Wildlife Service, the National Park Service owns and manages the remaining Maryland section of Assateague Island. Chincoteague National Wildlife Refuge, the Virginia section of the seashore, is owned (with the exception of 448 acres of Park Service in holdings) and managed by the U.S. Fish and Wildlife Service.

## METHODOLOGY AND ASSUMPTIONS

Information on bird species likely to occur in the vicinity of landing areas in the national seashore is available and was considered in the analysis. Analysis of potential impacts to non-avian species was based on the potential for wildlife species that are likely to occur in the habitats to be affected by the proposed alternatives. A discussion of wildlife species that have been documented to occur on the Assateague Island National Seashore is presented under the Affected Environment section in this document.

A similar methodology was used to determine the relative magnitude of impacts from PWC generated noise to waterfowl given the various management alternatives. No specific monitoring data is available at the park to quantify impacts; therefore, personal observations of park staff were used to determine areas of concern (nesting areas, critical habitat, etc.). These areas were identified and assessed relative to the number of personal watercraft potentially traveling in their proximity during critical seasons of use and by the type of species present in those sensitive areas (state, federally listed, species of concern, etc.).

**IMPACT OF PWC USE ON WILDLIFE AND HABITAT**

The following thresholds were used to determine the magnitude of effects on wildlife and wildlife habitat (special status species are discussed in the section entitled “Threatened, Endangered, or Special Concern Species,” beginning on page 139):

*Negligible:* There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be of short duration and well within natural fluctuations.

*Minor:* Impacts would be detectable, but they would not be expected to be outside the natural range of variability and would not be expected to have any long-term effects on native species, their habitats, or the natural processes sustaining them. Population numbers, population structure, genetic variability, and other demographic factors for species might have small, short-term changes, but long-term characteristics would remain stable and viable. Occasional responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, or other factors affecting population levels. Key ecosystem processes might have short-term disruptions that would be within natural variation. Sufficient habitat would remain functional to maintain viability of all species. Impacts would be outside critical reproduction periods for sensitive native species.

*Moderate:* Breeding animals of concern are present; animals are present during particularly vulnerable life-stages, such as migration or juvenile stages; mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park unit. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they could be outside the natural range of variability for short periods of time. Population numbers, population structure, genetic variability, and other demographic factors for species might have short-term changes, but would be expected to rebound to pre-impact numbers and to remain stable and viable in the long term. Frequent responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors affecting short-term population levels. Key ecosystem processes might have short-term disruptions that would be outside natural variation (but would soon return to natural conditions). Sufficient habitat would remain functional to maintain viability of all native species. Some impacts might occur during critical periods of reproduction or in key habitat for sensitive native species.

*Major:* Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or be permanent. Population numbers, population structure, genetic variability, and other demographic factors for species might have large, short-term declines, with long-term population numbers significantly depressed. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a long-term decrease in population levels. Breeding colonies of native species might relocate to other portions of the park. Key ecosystem processes might be disrupted in the long term or permanently. Loss of habitat might affect the viability of at least some native species.

*Impairment:* Some of the major impacts described above might be an impairment of park resources if their severity, duration, and timing resulted in the elimination of a native species or significant population declines in a native species, or they precluded the park’s ability to meet recovery objectives for listed species. In addition, these adverse, major impacts to park resources and values would

contribute to deterioration of the park's wild life resources and values to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's general management plan or other park planning documents.

### **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** Under this alternative the seashore's waters would be closed to PWC use except in the Ocean City Inlet on the island's north end, in the vicinity of Little Beach on the island's south end, and in the Sinepuxent Bay in the area between the SAV markers and the seashore boundary. Minor to moderate, short-term, adverse indirect impacts to wildlife and habitat are expected under alternative A.

*Northern Landing Area* — The northern landing area is in an area that experiences a high level of PWC use. As a result, associated human activity and noise levels near and at the northern landing area are typically high, especially during between May and September. Noise levels and the ability of PWC users to rapidly approach the northern landing area are expected to adversely affect terrestrial wildlife and shorebirds and waterfowl such as black duck, Canada goose, and surf scooters that may utilize the landing area and adjacent areas by causing alarm or flight responses. Effects are expected to be minor because species sensitive to a high level of noise and human activity would probably not regularly use the landing area or immediately adjacent habitats during high use periods.

Ground-nesting species at Assateague Island National Seashore include the American oystercatcher, the Canada goose, and the common tern. Nesting sites associated with all of these species have been identified in the northern section of the seashore near the inlet among the dunes and along the marsh hedges (NPS 2000c). Access to shore areas adjacent to the landing area with the potential to provide nesting areas for the piping plover is prohibited during the nesting season.

Reaction of various nesting bird species to nearby PWC use indicates that they can cause alarm or flight responses and in some cases, the abandonment of nests. However, due to constant use of the area by PWC, species sensitive to their presence would likely not nest in the areas affected by their use. In addition, separation of nesting areas from the northern landing area minimizes the potential for use of PWC at the landing area to disturb the federally endangered piping plover and other ground nesting birds documented to use the area.

If a significant storm or tide event reduced the dune field, the northern landing area could be reoccupied by breeding shorebirds and would be closed to all public access during the summer breeding season. With current closures, the only real issue remaining is the potential effects to nesting and foraging piping plovers on the beaches along the Ocean City Inlet where PWC are allowed to land. This involves only 1/10 of a mile of shoreline.

For birds raising offspring or building up fat reserves for migration, being chased from feeding areas can affect their potential for survival, especially when these disturbances continue for several days. For terns, which rest on beaches when not feeding, repeated disturbance could lead to exhaustion, potentially affecting the bird's ability to survive.

*Sinepuxent Bay and the Southern Landing Area* — Moderate, short-term, direct adverse effects to waterbird colonies and waterfowl that occur in the southern landing area, in nearshore habitats adjacent to the northern and southern landing areas, and in Sinepuxent Bay between the SAV buoys and the national seashore boundary are expected due to disruption of normal foraging or resting activities and alarm or flight responses. These effects are expected to occur more commonly in the quieter backbay areas and in the area around the southern landing area. Correspondence with the Virginia Department of Game and Inland Fisheries indicates that the southern PWC use area lies within the general vicinity of documented waterbird colonies containing yellow-crowned night heron, Caspian tern, Forster's tern, least tern, herring gull, black skimmer, common tern, American oystercatcher, great black-backed gull, green heron, cattle egret, snowy egret, great egret, little blue heron, tri-colored heron, glossy ibis, and black-crowned night heron (VADGIF 2001).

Waterfowl such as black duck, bufflehead, black scoter, surf scoter, Canada goose, and brant are commonly found in the area around the southern PWC landing area (VPI 1992). Species more sensitive to human presence and noise impacts would also likely be present. Occasional nearshore use of PWC in the vicinity of the southern landing area could adversely affect waterfowl by disrupting normal nesting, foraging, or resting activities, causing alarm and flight responses, and over time potentially resulting in habitat avoidance and displacement.

PWC users are able to more closely approach waterfowl that may feed or rest in nearshore habitats in Sinepuxent Bay in the area between the national seashore boundary and the SAV buoys. Black ducks, buffleheads, brant, and Canada geese are commonly found in the open water backbay areas and marshes of Sinepuxent Bay. Nearshore PWC use in the vicinity of the national seashore access area could adversely affect waterfowl by disrupting foraging, or resting activities, and causing alarm or flight responses, resulting in moderate adverse effects.

The period of greatest waterfowl use in the national seashore is from October through March, when PWC use is at the lowest level. Waterfowl do, however, occur on the national seashore throughout the year, but in lesser numbers.

In addition to ground-nesting, shorebird and waterfowl species, migratory birds can be affected by noise levels and encroachment associated with PWC use. The *Neotropical Migratory Songbird Coastal Corridor Study* indicates that various songbirds such as hummingbirds, swallows, orioles, tanagers, thrushes, and sparrows are abundant along the mid-Atlantic coastal region, and they are most abundant along the barrier islands. Migratory birds can be easily stressed and are very vulnerable during the intensive migration periods (Mabey et al. 1993). Adverse effects associated with PWC use would be minor, short-term, adverse impacts because most migration occurs during times of the year when PWC use is low.

Moderate, direct, short-term, adverse effects to fish species that occur in nearshore habitats of Assateague Island are expected. Essential fish habitat established under the Magnuson-Stevens Fishery Conservation and Management Act occurs for several species in Sinepuxent and Chincoteague Bays and in the vicinity of the northern and southern PWC landing areas. Species that commonly forage in shallow waters along the Assateague Island shoreline, such as bluefish, striped bass, and red drum, could be disrupted from normal feeding behavior as a result of PWC use in nearshore shallow water areas. Continuous PWC use in areas providing essential fish habitat functions, particularly in shallow water, could adversely affect suitability of the areas for species that depend on the functions that the areas provide for life cycle requirements.

Impacts from recreational and commercial boating activities are also being studied in an effort to protect the bay scallops at Chincoteague Bay. PWC use in Chincoteague Inlet is not as intense as at the northern end of the island. In addition, PWC use is prohibited in Tom's Cove, so there would be no PWC-related impacts to the Tom's Cove area. Resuspension of sediment in these waters, as well as pollution from emissions, can adversely affect local shellfish populations. This effect can be a direct one (e.g., bay scallops are highly susceptible to pollutants and high levels of suspended sediments), or indirect (e.g., elimination of habitats such as sea grasses). Commercial clam dredging has also been identified as a potentially significant factor impacting sea grasses and is currently prohibited in seagrass beds in both Maryland and Virginia.

No commercial shellfish aquaculture operations occur in the waters adjacent to the northern end of Assateague Island. However, some harvesting does take place in the southern end in Tom's Cove. As described previously, shellfisheries that occur in the area of Tom's Cove might be affected by PWC use. According to the Virginia Marine Resources Commission, several commercial leasing operations are active in the cove (K. Badger, VMRC, pers. comm., Oct. 19, 2001). In addition, a public clamming ground exists in the vicinity of Little Beach.

**Cumulative Impacts.** The northern landing area is located in an area that experiences a high level of PWC and conventional watercraft use. Based on surveys conducted by the Maryland Department of Natural Resources, the University of Delaware, and the National Park Service in 1999, an average of 56 boats and 8 personal watercraft were present per hour in the Ocean City Inlet at midday on weekends during the summer. Most small to mid-sized vessels can access nearshore areas adjacent to the northern landing area because adequate water depths occur next to the jetty and the landing area. As a result, human activity and noise levels near and at the northern landing area are typically high, especially between May and September. Noise levels from all motorized watercraft and the ability of personal watercraft to rapidly approach the northern landing area are expected to adversely affect terrestrial wildlife, such as shorebirds using the landing area and adjacent areas by causing alarm or flight responses. Adverse cumulative effects are expected to be moderate because species sensitive to a high level of noise and human activity are not expected to regularly use the landing area or immediately adjacent habitats during high use periods.

Moderate adverse effects to birds and other wildlife using areas in the vicinity of the southern landing area are expected. The frequency of PWC and other powered marine vessel use in the vicinity of the southern landing area is much less than at the northern landing area. As a result, the southern landing area is generally quieter, and birds and other wildlife species using nearby marsh and shoreline areas would likely be less accustomed to high levels of human activity and noise. Species more sensitive to human presence and noise impacts would also likely be present. Occasional nearshore PWC use near the southern landing area could adversely affect wildlife by disrupting normal nesting, foraging, or resting activities, causing alarm and flight responses, and over time potentially resulting in habitat avoidance and displacement.

Overall, cumulative effects on wildlife and wildlife habitats at Assateague Island National Seashore would be moderate. All wildlife impacts would be temporary and short term because the interactions between wildlife and visitors would be brief.

**Conclusion.** PWC use in the vicinity of the northern landing area would have minor, short-term, adverse effects on terrestrial wildlife, such as shorebirds, using the landing area and adjacent areas and other species such as fish that use nearshore habitats to forage for food. Effects would be minor because species sensitive to a high level of noise and human activity are not expected to regularly use the landing area or immediately adjacent habitats during periods of high human use.

The intensity of PWC use near the southern landing area would be much less than near the northern landing area. However, wildlife species using marsh and shoreline areas near the southern landing area would be less accustomed to high levels of human activity and noise. Occasional nearshore PWC use near the southern landing area would have moderate adverse effects on wading and shorebirds, waterfowl, and other wildlife by disrupting normal nesting, foraging, or resting activities.

On a cumulative basis wildlife and wildlife habitats that are dispersed throughout the national seashore would experience moderate adverse impacts from visitor uses (including PWC use). All wildlife impacts would be temporary and short term because the interactions between wildlife and visitors would be brief.

This alternative would not impair wildlife or wildlife habitat.

### **Impacts of Alternative B — Continue PWC Use under a Special Regulation, but Limit Area of Use**

**Analysis.** Impacts to wildlife and habitat under alternative B would be similar to those discussed under alternative A. Impacts to shorebirds, waterfowl, and other fish and wildlife species using shallow water habitats and the shoreline in Sinepuxent Bay would be reduced by prohibiting PWC use in this area. Impacts would be minor, short-term, adverse and indirect.

**Cumulative Impacts.** Moderate, short-term, adverse indirect impacts to wildlife and habitat are expected under alternative B. Cumulative impacts to wildlife species would be similar to those discussed under alternative A except in Sinepuxent Bay, where PWC use would be discontinued within the national seashore boundary. Minor, beneficial impacts over the short and long term would be expected as a result of restricting PWC use within Sinepuxent Bay.

**Conclusion.** Minor, short-term, adverse impacts on wildlife species near the northern landing area are expected, and moderate, short-term adverse impacts near the southern landing area, similar to those discussed for alternative A. However, prohibiting PWC use in Sinepuxent Bay within the national seashore boundary would increase the buffer between nearshore and shoreline habitats, lessening potential impacts to species that use these habitats to negligible, short-term, adverse impacts.

On a cumulative basis, moderate, short-term, adverse indirect impacts to wildlife and habitat are expected under alternative B, similar to alternative A.

This alternative would not impair wildlife or wildlife habitat.

### **Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Limit Area of Use and Implement Other Management Restrictions**

**Analysis.** Implementing no-wakes zones at the northern and southern landing areas and eliminating PWC use within seashore boundaries in Sinepuxent Bay would have negligible adverse impacts to wildlife within the national seashore boundaries. Impacts of PWC use associated with noise and potential collision impacts with wildlife would be minimized within national seashore boundaries with the reduction of allowable speeds and adverse noise fluctuations. Negligible, short-term adverse indirect impacts to wildlife and habitat are expected under alternative C.



**Cumulative Impacts.** Minor, short-term adverse indirect impacts to wildlife and habitat resulting from the combined effects of boats and PWC are expected under alternative C. The vicinity of the northern landing area experiences a high level of motorized watercraft use. Based on surveys conducted by Maryland Department of Natural Resources, the University of Delaware, and National Park Service staff, in 1999 an average of 56 boats and 8 personal watercraft per hour were present in the Ocean City Inlet at midday on weekends during the summer. Most small to mid-sized vessels can access nearshore areas adjacent to the northern landing area because adequate water depths occur next to the jetty and the landing area. As a result, human activity and noise levels near and at the northern landing area are typically high especially during the summer months between May and September. While a reduction in noise levels associated with PWC use and reduced speeds would have beneficial effects compared to use without wake restrictions, the effect would be minimal when considered with other watercraft activities in the area.

The frequency of PWC and other powered marine vessel use in the vicinity of the southern landing area is much less than at the northern landing area. As a result, the southern landing area is generally quieter. Birds and other wildlife species using marsh and shoreline areas on and in the vicinity of the southern landing area would likely be less accustomed to high levels of human activity and noise. Species more sensitive to human presence and noise impacts would also likely be present. Implementing no-wake requirements would reduce noise levels and how fast craft approach and maneuver in the southern landing area, resulting in beneficial effects on wildlife species compared to alternative A.

**Conclusion.** Alternative C would minimize potential adverse impacts of PWC use at the northern and the southern landing areas to negligible, short-term, adverse impacts. Effects of no-wake requirements in the northern landing area would be minimal, especially during high use periods due to background conditions in the Ocean City Inlet, while speed restrictions and reduced noise in the southern landing area would potentially have a greater effect.

On a cumulative basis, there would be minor, short-term, adverse indirect impacts to wildlife and habitat resulting from the combined effects of boat and PWC use under alternative C.

This alternative would not impair wildlife or wildlife habitat.

### **Impacts of the No-Action Alternative**

**Analysis.** Short- and long-term minor beneficial effects are expected under the no-action alternative. Eliminating PWC use in the national seashore would buffer terrestrial and nearshore wildlife and their habitats from adverse effects related to PWC use. PWC use would still have minor, short-term, adverse effects, as discussed under alternative A, on wildlife species utilizing habitats adjacent to national seashore boundaries.

**Cumulative Impacts.** As discussed for alternative A, the northern boundary of Assateague Island National Seashore is in an area that experiences a high level of PWC and conventional motorized watercraft use. As a result, human activity and noise levels are typically high, especially between May and September. The reduction in noise levels and other disturbances associated with PWC use within the national seashore boundary would have beneficial impacts on wildlife in the national seashore, although other impacts to wildlife would continue. The frequency of PWC and other powered marine vessel use in the vicinity of the southern landing area would be much less than at the northern landing area. As a result, the southern landing area is generally quieter, and birds and other wildlife species using nearby marsh and shoreline areas are likely less accustomed to high levels of human activity and

noise. Species more sensitive to human presence and noise impacts would also likely be present. Minor, short-term adverse indirect impacts are expected to wildlife and habitat due to all other motorized uses.

**Conclusion.** The no-action alternative would have short- and long-term minor beneficial effects from eliminating PWC use within the national seashore boundary, reducing PWC-related noise impacts and intrusions in wildlife habitat.

On a cumulative basis, minor, short-term adverse indirect impacts on wildlife due to noise would still occur as a result of PWC use adjacent to the national seashore boundary and other motorized uses.

This alternative would not impair wildlife or wildlife habitat.

## IMPACTS OF PWC NOISE ON AQUATIC FAUNA

### Methodology and Assumptions

Sounds produced in air behave differently than the one produced underwater. The measurement scales for sound in water and in air are also different, having a difference of 63 dB between them. Underwater, only 100 dB are equivalent to 160 dB in air (Cornell University n.d.). That is, a PWC producing 100 dB in air, produces 162 dB underwater.

Sound travels 4.5 times faster in water than it does in air, and low frequency sounds travel farther underwater than high frequency sounds. Noise from recreational watersports range from about 12 Hz to about 30 kHz and noise from commercial fishing fleets can generate levels five to 500 Hz when the sonar equipment is used.

In this assessment the equation used to calculate the noise of two or more personal watercraft operating at the same time (when one unit produces 82 dB), and at a distance of 82 feet from the source, was

$$10 \times \log((10^{82/10}) + (10^{82/10})) = 85 \text{ dB.}$$

Underwater noise from the same source, and at a distance of 82 feet, would be approximately 148 dB.

Consequently, the air and underwater noise calculated for the study areas, and based on PWC average numbers per hour estimated in the user trend section of this report, would be:

Ocean City Inlet (8 PWC / hour) = 91 dB (air) and 154 dB (underwater)

Sinepuxent Bay (5 PWC / hour) = 89 dB (air) and 152 dB (underwater)

Little Beach (2 PWC / hour) = 85 dB (air) and 148 dB (underwater)

The following equation was used to calculate noise levels at a given distance from shore:

$$20 \times \log (D1/D2)$$

where D1 = the location to be calculated

D2 = the distance of the known noise source

Consequently, for a distance of 100 feet from the source (wake-zone areas in Maryland waters), the estimated noise levels for the study areas would be:

Ocean City Inlet (8 PWC / hour) = 89.3 dB (air) and 152.3 dB (underwater)

Sinepuxent Bay (5 PWC / hour) = 87.3 dB (air) and 150.3 dB (underwater)

Little Beach (2 PWC / hour) = 83.3 dB (air) and 146.3 dB (underwater)

This means that two to eight personal watercraft operating 100 feet from shore would still produce sufficient noise levels that could have harmful effects on aquatic fauna.

Although the full impact that noise has on marine mammals is not completely understood, the increase in human-made underwater noises could be a serious problem to their survival as it can interfere with their methods of communication and hunting strategy (Coastal Caroline University 1998). The average vocalizations in whales range between 145 to 186 dB. Recreation and watersports generate noise from the motors greater than 100 dB over a range of frequencies (12 Hz – 30 kHz) (Coastal Caroline University 1998), and the hearing range of marine mammals can vary between 20 Hz to 150 kHz, while human have a hearing range between 20 Hz to 20 kHz.

Reactions to high levels of underwater noise vary between species, exposure length, and intensities and frequencies. PWC engines produce noise levels in the range of 70-102 dB per unit, and due to the nature of their use, they usually produce noise at various intensities. This continual change in loudness during normal use makes PWC use much more disturbing than the constant sounds of conventional motorboats (Bluewater Network 2001).

The effects underwater noise can have on marine life tend to vary between species. Increases in human-made noise have the potential to cause adverse effects on the survival, communication, and hunting methods of marine mammals. The reactionary response of marine mammals to low frequency, high decibel noises varies from species to species. As a general rule, whales will avoid sounds between 110 to 120 dB. At higher frequencies, all species become frantic, their heart rate increases, and in some cases, vocalization ceases (Coastal Caroline University 1998).

Recent studies have found that some mammals have stopped feeding and resting and became overly alert around increased presence of human noise sources. Recorded 160 dB in air can cause tissue damage to the ears of mammals. Temporary noise disturbances may alter the swimming path, heart rate, or breathing of a marine mammal, while long-term noise disturbances may inhibit mammals from accessing critical feeding, nesting, and mating habitat (ASA 2000).

It is widely known that intense sounds can damage the sensory cells of the ears of mammalian species, and the concern is that similar sounds can impair hearing in other wild species. One of the few direct studies on the impact of sound on the ear of fishes conducted under laboratory conditions (Hastings et al., 1996) found that when fish subjected to high decibel levels for four hours some damage resulted to the sensory cells of the ear. This damage does not show up until a few days after exposure to noise. Although this is a long-term effect (and regeneration did occur after a few days), aquatic species may be at a short-term disadvantage in terms of detecting predators or prey and so their survival may be impacted.

Although marine mammals show a diverse behavioral range that can obscure any correlation between a specific behavior and the impact from noise, it is well documented that these species rely on sound for communication, navigation, or detection of predators and prey. Disruption of any of these important functions could interfere with normal activities and behavior (Cornell University n.d.). The

impact of intense sound on marine mammals can range from minimal changes in behavior to physiological damage (permanent hearing loss) that may impair their ability to survive.

While there are some data on PWC-related noise effects on various species of marine mammals, reptiles, and fish, no specific monitoring data are available to quantify impacts. Therefore, personal observations of park staff were used to determine areas of concern. These areas were identified and assessed relative to the number of personal watercraft potentially traveling, their proximity during critical seasons of use, and the type of species present in those sensitive areas (state, federally listed, species of concern, etc.).

Marine mammals that can be affected by increased noise levels at Assateague Island National Seashore include various types of dolphins and whales. Both the loggerhead sea turtles and diamondback terrapins have been identified in national seashore waters. Terrapin have been observed along the oceanside, along the northern boundary waters by the Ocean City Inlet, and along the bayside of the northern portion.

### **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** Under this alternative, the seashore's waters would be closed to PWC use except in the Ocean City Inlet on the island's north end, in the vicinity of Little Beach on the island's south end, and in the Sinepuxent Bay area between the SAV markers and the seashore boundary. Moderate adverse effects on aquatic fauna attempting to enter the Ocean City inlet may be expected. Noise emitted from PWC may create a "sound barrier" that may limit marine reptiles and mammals from entering the back bays. These conditions may not cause mortality but may have an adverse effect on spatial distribution of these marine organisms. Shallow waters in the Sinepuxent Bay section of the park would suffer a minor to moderate impact from PWC activity. Fish populations may be affected to the extent that some local populations could be in danger (see potential adverse effects on fish ear bones in previous section) and/or would relocate to other waters. Potential reduction in noise emissions (as forecasted by the industry) might contribute to a reduction of adverse impacts. Long-term effects under this alternative might include a reduction in species diversity in shallow waters and a limitation for access of fauna through the inlet. Impacts to the aquatic fauna in the Little Beach area would be somewhat different than those in Ocean City Inlet. The extent of PWC use in this area is limited. Low PWC numbers are observed within the park's waters, the Chincoteague Inlet is not heavily used by boaters, and its width allows for a minimization of noise impacts on aquatic fauna (the surface area is several times that of Ocean City Inlet). However, a minor to moderate adverse effect may be observed in the vicinity of salt-marshes that are heavily used by fish and other organisms as breeding grounds or permanent habitats.

**Cumulative Impacts.** The northern boundary of Assateague Island National Seashore is in an area that experiences a high level of use by both personal and conventional watercraft. As a result, human activity and noise levels near the northern boundary of the national seashore are typically high especially between May and September. Underwater noise sources at the Ocean City Inlet area include powerboats, personal watercraft, commercial and official (U.S. Coast Guard, local police) vessels. In addition, new PWC and boat engines are being introduced that reduce noise either by use of four-stroke engines or specific noise reduction technology (Sea-Doo 2001b; Yamaha Motor 2001). Moderate, long-term, adverse cumulative impacts could be possible with an increase in watercraft use.

Little Beach (southern end of Assateague Island) is a quiet area and a few personal watercraft and boats are the main sources of underwater noise, while at Sinepuxent Bay underwater noise is produced

by the active presence of various types of boats and personal watercraft. The frequency of PWC and other powered marine vessel use in the vicinity of the southern landing area is much less than at the northern landing area and their cumulative actions could produce minor to moderate adverse effects.

**Conclusion.** Alternative A would have minor to moderate adverse effects on aquatic fauna, particularly in the Ocean City Inlet and Sinepuxent Bay.

On a cumulative basis long-term moderate adverse impacts could be possible with an increase in watercraft use in the Ocean City Inlet, while less use in the vicinity of the southern landing area could produce minor to moderate adverse effects.

No impairment to aquatic fauna from noise generated by PWC use is expected.

### **Impacts of Alternative B — Continue PWC Use under a Special Regulation, but Limit Area of Use**

**Analysis.** This alternative is the same as alternative A except an additional geographic restriction on PWC use would be implemented. The open area in the Sinepuxent Bay between the seashore boundary and the SAV buoy line would be closed to PWC use.

As previously mentioned, the two most common areas of PWC use at Assateague Island are the Ocean City Inlet, and Sinepuxent Bay. In addition to the PWC, various types of low impact vehicles such as canoes, kayaks, and sailboats occupy the waters near the southern landing area and Sinepuxent Bay. Although sailboats often use auxiliary engines when navigating the inlets, these types of marine vehicles tend to have very low noise associated with their use.

Based on the scientific information previously described, Ocean City inlet and Sinepuxent Bay represent the most sensitive habitats potentially affected by underwater noise. The high numbers of PWC in the inlet may create a “sound barrier” for many marine mammals and reptiles. At Sinepuxent Bay, the acreage-ft of water is larger than at Ocean City inlet, however, the bay is characterized by very shallow waters, increasing the adverse effects of underwater noise on marine organisms, particularly fish.

Ban on PWC use in Sinepuxent Bay within national seashore boundaries would eliminate impacts to aquatic fauna from PWC noise in the area. The impacts in the inlets from implementation of this alternative would be similar to those described for alternative A.

**Cumulative Impacts.** The long-term cumulative effects of selecting this alternative would be similar to those of alternative A. However, banning PWC use in the park waters in Sinepuxent Bay would create long-term beneficial impacts on the aquatic fauna of this area.

**Conclusion.** This alternative would have a beneficial impact to aquatic fauna from a reduction in underwater noise in the Sinepuxent Bay area within the national seashore. Similar to alternative A, a reduction in emissions due to new technologies would also contribute to reduced noise. In the Ocean City Inlet and at Little Beach, impacts would be similar to those described for alternative A. PWC use would have a minor to moderate adverse effect on aquatic fauna.

The long-term cumulative effects would be similar to those of alternative A. However, banning PWC use in Sinepuxent Bay would create beneficial, long-term impacts in this area.

This alternative would not impair aquatic fauna.

### **Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Limit Area of Use and Implement Other Management Restrictions**

**Analysis.** Similar to alternative B, alternative C would allow PWC use only at the two landing areas in the northern and southern ends of the island. However, PWC users would also have to comply with no-wake zones (maximum speed of 6 mph) when accessing landing points within the seashore boundary. This restriction would limit the use of PWC as a recreational vehicle in this area.

Enforcing speed limits would also reduce noise emissions in nearshore areas. However, as described in the scientific literature, sound travels in water faster and with higher intensities than in air. Consequently, PWC units operating in waters of 100 to 200 feet from shore would still have a minor to moderate impact on aquatic fauna, similar to those described in alternative B. In the long-term, a reduction in noise emissions as a consequence of speed limitations, and the potential reduction in noise emissions (as forecasted by the industry) from newer machines in upcoming years, may contribute to a reduction of adverse impacts to aquatic fauna.

**Cumulative Impacts.** Adverse long-term cumulative impacts are not expected to occur from implementation of this alternative. When compared to alternative A, the no-wake zones have a beneficial effect on noise in nearshore waters. However, impacts in offshore waters would remain similar to those presented in alternative A.

**Conclusion.** PWC use restrictions under alternative C would contribute to a reduction in underwater noise in nearshore areas, particularly in Sinepuxent Bay. However, fauna living in littoral environments (e.g., marshes and associated fauna, benthic fish species) would still incur minor impacts.

On a cumulative basis, no change is expected in deeper waters and in areas outside the national seashore's jurisdictional limits, so impacts would be the same as alternative A.

No impairment to aquatic fauna is expected.

### **Impacts of the No-Action Alternative**

**Analysis.** Short- and long-term minor beneficial effects are expected under the no-action alternative. Elimination of PWC use in the national seashore would provide aquatic fauna protected habitat and feeding areas away from adverse effects of PWC use. PWC use would still be expected to have moderate adverse effects, as discussed under alternative A, on aquatic fauna species utilizing habitats adjacent to national seashore boundaries. In the long-term, this alternative would create beneficial impacts by eliminating disturbances that may adversely affect the presence of aquatic fauna in these areas.

**Cumulative Impacts.** Cumulative impacts would be similar to alternative A except long-term beneficial impacts could be expected from a reduction of PWC use in NPS jurisdictional waters (400 feet and more from shore).

**Conclusion.** The no action alternative would result in beneficial, long-term impacts to the underwater soundscape of Assateague.

Cumulative impacts would be similar to alternative A except beneficial, long-term impacts could be expected from a reduction of PWC use in NPS jurisdictional waters (400 feet and more from shore).

No impairment to aquatic fauna is expected.

## **THREATENED, ENDANGERED, OR SPECIAL CONCERN SPECIES**

### **GUIDING REGULATIONS AND POLICIES**

The Endangered Species Act (16 USC 1531 et seq.) mandates that all federal agencies consider the potential effects of their actions on species listed as threatened or endangered. If the National Park Service determines that an action may adversely affect a federally listed species, consultation with the U.S. Fish and Wildlife Service is required to ensure that the action will not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat.

Informal consultation was initiated with the U.S. Fish and Wildlife Service during the internal scoping period for this project. A list of species that are known to occur or may occur within or adjacent to PWC activity within the boundaries of Assateague Island National Seashore was requested. The response from the U.S. Fish and Wildlife Service is included in appendix B.

An analysis of the potential impacts to each species listed in the letter is included in this section. At Assateague Island National Seashore it has been determined that none of the alternatives would adversely affect any of the listed species. The completed environmental assessment will be submitted to the U.S. Fish and Wildlife Service for its review. If the agency concurs with the finding of the National Park Service, no further consultation will be required.

Formal consultation would be initiated if the National Park Service determined that actions associated with the preferred alternative are likely to adversely affect one or more of the federally listed threatened or endangered species identified in the national seashore. At that point a biological assessment would be prepared to document the potential effects. From the date that formal consultation was initiated, the U.S. Fish and Wildlife Service would be allowed 90 days to consult with the agency and 45 days to prepare a biological opinion based on the biological assessment and other scientific sources. The U.S. Fish and Wildlife Service would state its opinion as to whether the proposed PWC activities would be likely to jeopardize the continued existence of the listed species or to result in the destruction or adverse modification of critical habitat. Such an opinion would be the same as a determination of impairment. To ensure that a species was not be jeopardized by PWC activities, the National Park Service would confer with the U.S. Fish and Wildlife Service to identify recommendations for reducing adverse effects and would integrate those into the preferred alternative.

*NPS Management Policies 2001* state that potential effects of agency actions will also be considered on state or locally listed species. The National Park Service is required to control access to critical habitat of such species, and to perpetuate the natural distribution and abundance of these species and the ecosystems upon which they depend.

The species at Assateague Island National Seashore that have the potential to be affected by proposed PWC management alternatives include species that are known to inhabit or are likely to inhabit the area, plus those that could possibly be found in the area, but would most likely be transients or migrants.

## METHODOLOGIES AND ASSUMPTIONS

Identification of state and federally listed species was accomplished through discussions with park staff, and informal consultation with U.S. Fish and Wildlife Service in Maryland and Virginia, the National Marine Fisheries Service, Maryland Department of Natural Resources, Virginia Department Game and Inland Fisheries and the Virginia Department of Agriculture and Consumer Services, Bureau of Plant Protection. Response letters from the above referenced agencies are included in appendix B.

Primary steps in assessing impacts on listed species were to determine (1) which species are found in areas likely to be affected by management actions described in the PWC alternatives, (2) current and future use and distribution of PWC by alternative, (3) habitat loss or alteration caused by the alternatives, and (4) displacement and disturbance potential of the actions and the species' potential to be affected by PWC activities. The information contained in this analysis was obtained through best professional judgment of park staff and experts in the field (as cited in the text), and by conducting literature review.

Documentation of the occurrence and locations of federal and state rare, threatened and endangered species on Assateague Island National Seashore was provided by National Park Service through several studies and surveys that have been conducted at the park. Determination of the potential for adverse effects to rare threatened and endangered species was based on the locations of sensitive species with respect to PWC use and the potential for the use to affect the species. All known federally listed species that occur on the Assateague Island National Seashore are discussed in the analysis. Only state listed species that occur in the vicinity of the PWC use areas, or that have potential to be affected by PWC use, are discussed in the analysis.

## IMPACT OF PWC USE ON SUCH SPECIES

The Endangered Species Act defines the terminology used to assess impacts to listed species as follows:

*No effect:* A proposed action would not affect a listed species or designated critical habitat.

*May affect / not likely to adversely affect:* Effects on special status species would be discountable (i.e., extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or completely beneficial.

*May affect / likely to adversely affect:* When an adverse effect to a listed species might occur as a direct or indirect result of proposed actions and the effect would either not be discountable or completely beneficial.

*Is likely to jeopardize proposed species/adversely modify proposed critical habitat):* The appropriate conclusion when the National Park Service or the U.S. Fish and Wildlife Service identify situations in which PWC use could jeopardize the continued existence of a proposed species or adversely modify critical habitat to a species within and/or outside the park boundaries.

*Impairment:* For the purposes of this analysis, those effects likely to jeopardize proposed species/adversely modify proposed critical habitat would have the potential to impair park resources. At this level, the integrity of park resources would substantially affect natural systems and the ability of future generations to enjoy the resource.



## **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** Implementation of alternative A is not likely to adversely affect federally listed threatened or endangered species in Assateague Island National Seashore. Piping plover nesting areas are located several hundred feet from the northern landing area. Access to shore areas adjacent to the landing area with the potential to provide nesting areas for the piping plover is prohibited during the nesting season. The report entitled “Management and Monitoring of the Piping Plover at Assateague Island National Seashore” (NPS 2000c) indicates that the direct effects on plovers from PWC use are difficult to document (with only one documented incident) and that the peak PWC use period is usually during the hottest part of the day when plovers are not active. The reaction of various nesting bird species to nearby PWC use indicates that they can cause alarm or flight responses and in some cases the abandonment of nests. However, existing background noise and separation of nesting areas from the northern landing area minimizes the potential for PWC use at the landing area to disturb the federally endangered piping plover.

Several endangered and threatened turtles including Kemp’s Ridley sea turtle, green sea turtle, leatherback sea turtle and the loggerhead sea turtle have been documented by the National Marine Fisheries Service as occurring in the waters off of Assateague Island during the warmer summer months. The agency stated that the listed turtles are not likely to occur in the vicinity of the PWC landing areas. No loggerhead nests have been confirmed on Assateague Island since 1999 (NPS 1999a). Female loggerhead sea turtles only come to shore in an attempt to nest. Nesting populations occur primarily from Florida to North Carolina, sporadically in Virginia, and rarely from Maryland to New Jersey. Nesting activities occur at night when the turtles come ashore to lay their eggs. Because of the very rare occurrence of the turtle at Assateague Island and the timing of nesting activities, it is very unlikely that PWC use would adversely affect loggerhead sea turtles.

The federal and Virginia threatened bald eagle is documented to nest in the Chincoteague National Wildlife Refuge (K. Mayne, USFWS, letter, Sept. 25, 2001; NPS 2000c). Although PWC use is not likely to directly affect the bald eagle, foraging activities may be affected as a result of the physical presence the machines and related noise. Limited PWC use in the southern landing area would minimize potential for disturbance of bald eagles during foraging activities.

The federal and Virginia endangered Delmarva fox squirrel was translocated to Chincoteague National Wildlife Refuge in the early 1970s as part of the recovery plan for the squirrel. The squirrel currently inhabits loblolly pine forests in the refuge as well as the Virginia section of Assateague Island National Seashore (USFWS 1993). Use of the PWC landing areas is not likely to have any effect on the Delmarva fox squirrel because the landing areas are not located in suitable habitat for the squirrels.

The federally threatened seabeach amaranth, considered extirpated from Maryland since 1977, has been recently documented to occur on the north end and within the off-road vehicle zone on Assateague Island. Use of the PWC landing areas is not likely to have any affect on the seabeach amaranth because the landing areas are not located in the vicinity of the threatened plants.

**Cumulative Impacts.** Cumulative impacts are not likely to adversely affect federally listed threatened or endangered species on Assateague Island National Seashore. The northern landing area is in an area that experiences a high level of both PWC and conventional watercraft use. Based on surveys by the Maryland Department of Natural Resources, the University of Delaware, and the National Park Service in 1999, an average of 56 boats and 8 personal watercraft per hour were present in the Ocean City Inlet at midday on weekends during the summer. Most small to mid-sized vessels can access

nearshore areas adjacent to the northern landing area because water depths are adequate next to the jetty and the landing area. As a result, human activity and noise levels near and at the northern landing area are typically high, especially between May and September. Noise levels and the ability of PWC users to rapidly approach the northern landing area would be expected to adversely affect shorebirds using the landing area and adjacent areas by causing alarm or flight responses. Effects are expected to be minor to nesting piping plover because nesting areas are buffered from the northern landing area by an area of vegetated dune habitat. In addition, access to areas in the vicinity of nesting piping plover is restricted during the nesting season.

**Conclusion.** Piping plovers are not likely to be adversely affected by PWC use at the northern or southern landing area or in Sinepuxent Bay due to the distance of the landing areas from nesting areas and access restrictions around piping plover nesting areas during the nesting season. Loggerhead sea turtles are not likely to be adversely affected by PWC use in the northern or southern landing area or in Sinepuxent Bay because they rarely use Maryland locations as nesting sites, and nesting activities occur at night. Foraging activities of bald eagles could potentially be affected by PWC use near the southern landing area; however, because such use in this area is limited, adverse effects on the species are not likely. No effects to the Delmarva fox squirrel or seabeach amaranth are expected as a result of PWC use within Assateague Island National Seashore because these species do not occur in areas affected by PWC use.

Cumulative impacts are not likely to adversely affect threatened, endangered species, or special concern species in Assateague Island National Seashore.

This alternative would not impair threatened, endangered, or special concern species.

### **Impacts of Alternative B — Continue PWC Use under a Special Regulation, but Limit Area of Use**

**Analysis.** Implementation of alternative B is not likely to adversely affect federally listed threatened or endangered species in Assateague Island National Seashore. Effects to federally listed threatened or endangered species related to PWC use under alternative B would be the same as those discussed for alternative A because no federally listed species are known to occur in the areas that would be affected by the limited use restrictions.

**Cumulative Impacts.** Cumulative impacts are not likely to adversely affect federally listed threatened or endangered species on Assateague Island National Seashore. Cumulative impacts to threatened, endangered, or special concern species that could be affected by PWC use would be the same as those discussed for alternative A, because no federally listed species are known to occur in the areas that would be affected by the limited use restrictions.

**Conclusion.** Piping plovers and loggerhead sea turtles are not likely to be adversely affected by PWC use, as described for alternative A. Foraging activities of bald eagles could potentially be affected by PWC use near the southern landing area, however, PWC use is limited in this area, thus minimizing the potential for adverse effects. No effects to the Delmarva fox squirrel or seabeach amaranth are expected as a result of PWC use within Assateague Island National Seashore because the species do not occur in areas affected by PWC use.

Cumulative impacts are not likely to adversely affect threatened, endangered, or special concern species, as discussed for alternative A.

This alternative would not impair threatened, endangered, or special concern species.

### **Impacts of Alternative C — Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions**

**Analysis.** Alternative C is not likely to adversely affect federally listed threatened or endangered species in the Assateague Island National Seashore. Effects to federally listed threatened or endangered species associated with PWC use under alternative C would be similar to those discussed under alternative A. However, the potential for impacts would be further minimized due to reduced levels of activity and use. Enforcement of no-wake zones in the vicinity of the landing areas, in particular the northern landing area, would decrease potential for nearshore noise associated with the PWC use to adversely affect protected species such as the piping plover.

**Cumulative Impacts.** Cumulative impacts are not likely to adversely affect federally listed threatened or endangered species in Assateague Island National Seashore. Cumulative impacts to federally listed threatened or endangered species associated with PWC use under alternative C would be the same as those discussed under alternative B.

**Conclusion.** Piping plovers and loggerhead sea turtles are not likely to be adversely affected by PWC use, as described for alternative A. Foraging activities of bald eagles could potentially be affected by PWC in the area of the southern landing area; however, PWC use is limited in the area, thus minimizing the potential for adverse effects. Implementing no-wake zones would further minimize potential of disturbance to the piping plover or bald eagle by reducing noise levels in nearshore areas. No effects to the Delmarva fox squirrel or seabeach amaranth are expected because these species do not occur in areas affected by PWC use.

Cumulative impacts to threatened, endangered, or special concern species related to PWC use under alternative C would be the same as those discussed under alternative A. Existing background noise, especially in the vicinity of the northern landing area, would minimize the effects of implementing alternative C.

This alternative would not impair threatened, endangered, or special concern species.

### **Impacts of the No-Action Alternative**

**Analysis.** No effects to threatened or endangered species are expected under the no-action alternative. Eliminating PWC use within the national seashore boundary would ensure that these species would not be affected by PWC use within the national seashore boundary.

**Cumulative Impacts.** No cumulative impacts to threatened or endangered species are expected as a result of implementing the no-action alternative. While a reduction in noise levels and other disturbances associated with PWC use within national seashore boundary would have beneficial effects, the effects would be minimal when considering existing background conditions, particularly in the vicinity of the northern landing area.

**Conclusion.** Eliminating PWC use within national seashore boundaries would ensure that no PWC-related impacts would occur to threatened and endangered species as a result of their use within the national seashore boundary.

While a reduction in noise levels and other disturbances associated with PWC use would have beneficial effects, the effects would be minimal on a cumulative basis when considering existing background conditions, particularly in the vicinity of the northern landing area.

This alternative would not impair threatened, endangered, or special concern species.

## **SHORELINE AND SUBMERGED AQUATIC VEGETATION**

### **METHODOLOGY AND ASSUMPTIONS**

Personal watercraft have the potential to impact shoreline vegetation and submerged aquatic vegetation as a result of operating in shallow waters or adjacent to wetland habitats. Direct impacts resulting from collision or mechanical removal can occur. Potential indirect impacts include the deposition of suspended sediments on aquatic or submerged vegetation or modification of substrates. Impacts to shoreline vegetation associated with foot traffic adjacent to landing zones can also occur.

Primary steps in assessing impacts to shoreline vegetation and SAV were to determine (1) occurrence and location of vegetation in areas likely to be affected by management actions described in the personal watercraft alternatives, (2) current and future use and distribution of personal watercraft by alternative, (3) habitat impact or alteration caused by the alternatives, and (4) disturbance potential of the actions and the potential to affect shoreline or aquatic vegetation as a result of personal watercraft activities. The information contained in this analysis was obtained through best professional judgment of park staff and experts in the field, and by conducting literature review.

### **IMPACTS ON SHORELINE VEGETATION FROM PWC USE**

The following thresholds were used to determine the magnitude of effects on shoreline vegetation and SAV communities:

*Negligible:* No shoreline vegetation or SAV communities are present in areas likely to be accessed by personal watercraft; no impacts or impacts with only temporary effects are expected.

*Minor:* Shoreline vegetation or SAV communities are present, but only in low numbers. Occasional impacts to species or communities are expected, but with no impacts or limited impacts on the continued existence of the species or viable functioning communities within the national seashore.

*Moderate:* Shoreline vegetation or SAV communities are present in areas accessible by personal watercraft. Direct loss of vegetation or other effects are expected on an occasional basis, but are not expected to threaten the continued existence of the species or viable functioning communities in the national seashore.

*Major:* Shoreline vegetation or SAV communities are present in relatively high numbers in areas accessible by personal watercraft. Direct loss of vegetation or other effects are expected on a regular basis and could threaten continued survival of species or communities of species in the park.

*Impairment:* PWC use would contribute substantially to the deterioration of the shoreline or shallow water environment to the extent that the park's shoreline or submerged vegetation

would no longer function as a natural system. In addition, these adverse major impacts to park resources and values would:

contribute to deterioration of these resources to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's general management plan or other park planning documents.

### **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** Under this alternative the seashore's waters would be closed to PWC use except in the Ocean City Inlet on the island's north end, in the vicinity of Little Beach on the island's south end, and in Sinepuxent Bay between the SAV buoys and the seashore boundary

Short-term, minor adverse direct and indirect impacts to shoreline vegetation are expected under alternative A. Direct impacts from PWC use to shoreline vegetation at the northern PWC landing area are not expected because the shoreline is characterized by an unvegetated beach. An access trail to the Atlantic Ocean beaches is provided at the northern landing area, and some trampling of vegetation would occur as a result of foot travel off of the trails.

The southern quarter of the landing area designated as Little Beach is characterized by areas of sparse shrubland habitat, naturally occurring unvegetated beaches, maritime/coastal loblolly pine wetland forest, grass shrubland, and a few small areas of dune grassland. PWC are only allowed shore access to the area designated as Little Beach in the southern landing area. Impacts to shoreline vegetation in the area of Little Beach are expected to result primarily from foot traffic. Impacts to shoreline vegetation associated with the low salt marsh habitats in the northern section of the southern landing would occur if PWC users accessed the shallow inter-tidal zones. Direct impacts to marsh vegetation resulting from mechanical removal or damage from collision could occur. Indirect impacts due to modification of substrates (i.e., scouring) associated with PWC operation in shallow water habitats could also occur. Adverse effects are expected to be minor due to limited use of the southern landing area; also PWC users would likely avoid shallow water habitats because of the potential damage to their craft.

Under this alternative PWC users would not be allowed to operate in shoreline areas of Sinepuxent Bay, so shoreline vegetation should not be directly affected. Some indirect minor adverse impacts might occur from the resuspension of sediments in adjacent waters. New proposed MDNR regulations limit PWC operation in all waters within 100 feet from shore and less than 18 inches in depth to 6 miles per hour. This could have a beneficial effect by reducing adverse impacts on water quality in shoreline areas if the regulation is enforced. Limiting PWC operations to idle speeds in waters less than 18 inches depth would reduce the potential for resuspension of sediments and increased turbidity, particularly in the shallow waters of Sinepuxent Bay.

**Cumulative Impacts.** Cumulative impacts to shoreline vegetation are expected under alternative A. Direct impacts from PWC use to shoreline vegetation at the northern PWC landing area are not expected because the shoreline is characterized by an unvegetated beach. An access trail to Atlantic Ocean beaches is provided at the northern landing area, and some trampling of vegetation would occur as a result of off-trail foot traffic by PWC and non-PWC visitors. Direct impacts to marsh vegetation

resulting from mechanical removal or damage from collision could occur within Sinepuxent Bay and in the area of Little Beach, but are expected to be minor. Indirect impacts due to modification of substrates (i.e., scouring) associated with PWC operation in shallow water habitats could also occur.

**Conclusion.** Impacts to shoreline vegetation in the northern and southern landing areas would result primarily from foot traffic associated with access by PWC users to beach areas. In the southern landing area additional impacts to marsh habitats could also occur as a result of PWC use in shallow water habitats. The impacts would be minor because use of this area is limited and because PWC users would likely avoid operating in shallow water habitats to prevent damage to their craft.

Cumulative impacts to shoreline vegetation are expected. No impacts are expected at the northern landing area because the shoreline is characterized by an unvegetated beach, although some vegetation along trails to beaches could be trampled by PWC and non-PWC visitors. Direct impacts to marsh vegetation resulting from mechanical removal or damage from collision could occur within Sinepuxent Bay and in the area of Little Beach, but are expected to be minor. Indirect impacts due to modification of substrates (i.e., scouring) associated with PWC operation in shallow water habitats could also occur.

No impairment to shoreline and submerged aquatic vegetation due to PWC use is expected. (Also see section below entitled “Impact on Sensitive Submerged Aquatic Vegetation from PWC Access.”)

### **Impacts of Alternative B — Continue PWC Use under a Special Regulation, but Limit Area of Use**

**Analysis.** This alternative would be the same as alternative A except that an additional geographic restriction on PWC use would be implemented. The open area in the Sinepuxent Bay between the seashore boundary and the SAV markers would be closed to PWC use. Because this area of Sinepuxent Bay is not currently accessible from the shore, there would be no reduction in impacts to shoreline vegetation. Other effects to shoreline vegetation associated with PWC use under alternative B would be the same as those discussed under alternative A. (Also see the section below entitled “Impact on Sensitive Submerged Aquatic Vegetation from PWC Access.”)

**Cumulative Impacts.** Like alternative A, impacts to vegetation at the northern landing area and in the area of Little Beach would occur. Some vegetation could be trampled as a result of off-trail foot travel by PWC and non-PWC visitors. Direct impacts to marsh vegetation resulting from mechanical removal or damage from collision could occur in the area of Little Beach. Indirect impacts due to modification of substrates (i.e., scouring) associated with PWC operation in shallow water habitats could also occur.

**Conclusion.** Impacts to shoreline vegetation in the northern and southern landing areas would be similar to those described for alternative A and would result primarily from foot traffic associated with PWC user access to beach areas. In the southern landing area additional impacts to marsh habitats could occur as a result of PWC use in the shallow water habitats, but this impact is expected to be minor due to limited use of the area and the fact that PWC users generally avoid shallow water areas. Closing the area of Sinepuxent Bay within the national seashore boundary under alternative B would not affect shoreline vegetation in that area.

Like alternative A, cumulative impacts to vegetation at the northern landing area and in the area of Little Beach would occur, including trampling of trailside vegetation by PWC and non-PWC visitors. Direct impacts to marsh vegetation resulting from mechanical removal or damage from collision could

occur in the area of Little Beach, but are expected to be minor. Indirect impacts due to modification of substrates (i.e., scouring) associated with PWC operation in shallow water habitats could also occur.

No impairment to shoreline vegetation due to PWC use is expected.

### **Impacts of Alternative C — Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions**

**Analysis.** Similar to alternative B, alternative C would allow PWC use only at the two landing areas at the northern and southern ends of the island. However, an additional management restriction would be implemented. PWC would have to comply with no-wake zones (maximum 6 mph speeds) when accessing landing points within the seashore boundary. This restriction would limit the use of PWC as a recreational vehicle in this area, and favor its use as a transport vehicle from point A to point B. Effects to shoreline vegetation associated with PWC use under alternative C would be the same as those discussed under alternative B.

**Cumulative Impacts.** Cumulative impacts resulting from the implementation of alternative C would be similar to alternative B, with a reduced potential for modification of substrates.

**Conclusion.** Impacts to shoreline vegetation near the northern and southern landing areas would be the same as those described for alternative A and would result primarily from foot traffic associated with PWC user access to beach areas. The no-wake zones would not change the effect on shoreline vegetation at the northern or southern landing area since beaching and visitor hiking in these areas would continue. In the southern landing area additional impacts could occur to marsh habitats as a result of PWC use in the shallow water habitats; however, these impacts would be minor because of limited PWC use and because PWC users tend to avoid shallow water areas. Closing the portion of national seashore in Sinepuxent Bay to PWC use would not have a protective effect on shoreline vegetation.

Cumulative impacts resulting from the implementation of alternative C would be similar to alternative A, with a reduced potential for modification of substrates.

No impairment to shoreline due to PWC use is expected.

### **Impacts of the No-Action Alternative**

**Analysis.** Prohibiting PWC access to Assateague Island National Seashore would reduce the amount of foot traffic in vegetated areas around the existing landing areas, thus removing PWC user impacts in these areas. Closing the southern landing area to PWC use would also eliminate the potential for PWC users to access shallow water marsh habitats that occur in this area. Minor, long-term beneficial effects to shoreline vegetation would be expected as a result of implementing the no-action alternative.

**Cumulative Impacts.** Closing the northern landing area to PWC use would reduce PWC user traffic; however, traffic associated with non-PWC users in the vicinity of the northern landing area would continue to occur, somewhat limiting the beneficial effects of the removal of PWC traffic.

**Conclusion.** Effects to shoreline vegetation from closing Assateague Island National Seashore to PWC use would be minor, beneficial, and long term.

On a cumulative basis beneficial effects would be minor because of continued foot traffic associated with other visitors in the vicinity of the northern landing and southern landing areas.

No impairment to shoreline vegetation due to PWC use is expected.

#### **IMPACT ON SUBMERGED AQUATIC VEGETATION FROM PWC ACCESS**

##### **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** Under alternative A the seashore's waters would be closed to PWC use except in the Ocean City Inlet on the island's north end, in the vicinity of Little Beach on the island's south end, and in the area between the SAV buoys and the seashore boundary. Negligible to minor direct impacts to SAV beds are expected under alternative A. Based on surveys conducted by the Virginia Institute of Marine Science, there are no SAV beds in the immediate vicinity of the northern or the southern PWC landing areas. PWC use is allowed between the SAV buoys and the national seashore boundary in a small area in the northern section of Sinepuxent Bay. PWC use is restricted to areas outside of the delineated SAV beds. Direct impacts to SAV beds from PWC use could occur in shallow areas where submerged vegetation has not been delineated. Additional negligible impacts could result from settling of suspended sediments on submerged vegetation following suspension as a result of PWC use in shallow areas. New Maryland legislation has been adopted to protect fragile underwater grasses, which prohibits PWC operation above idle speed in water less than 18 inches deep, and authorizes the Department of Natural Resources to adopt regulations limiting PWC use in waters with a depth of less than one meter.

**Cumulative Impacts.** Cumulative impacts to SAV communities are expected to be negligible because PWC use and clam dredging are restricted in areas along the Assateague Island National Seashore where SAV beds have been documented. The potential for submerged aquatic vegetation to spread into areas designated for PWC and other watercraft use could result in negligible to minor direct impacts to the vegetation if restricted use areas were not adjusted to encompass the new SAV communities.

**Conclusion.** Impacts to SAV communities resulting from PWC use in designated use areas would be negligible to minor.

Cumulative impacts to SAV communities are expected to be negligible because PWC use and commercial clam dredging are restricted in areas along the Assateague Island National Seashore where SAV beds have been documented. Negligible to minor adverse effects could occur to submerged vegetation if communities spread into areas that are designated for PWC and other marine watercraft uses.

No impairment to SAV communities due to PWC use is expected.

##### **Impacts of Alternative B — Continue PWC Use under a Special Regulation, but Limit Area of Use**

**Analysis.** Negligible direct adverse impacts to SAV are expected under alternative B. Based on surveys conducted by the Virginia Institute of Marine Science, there are no SAV beds in the immediate vicinity of the northern or southern PWC landing areas. Under alternative B, PWC use in



Sinepuxent Bay would be restricted to areas outside delineated SAV beds and outside the national seashore boundary. Prohibiting PWC access areas in Sinepuxent Bay within national seashore would result in beneficial effects on SAV communities by creating a buffer between the beds and the PWC use area. Direct impacts to SAV beds could as a result of PWC use in shallow areas where communities have not been delineated. Additional negligible impacts could result from the settling of suspended sediments on plants following suspension by PWC use in shallow areas.

**Cumulative Impacts.** Cumulative impacts to SAV communities are expected to be negligible because PWC and other watercraft use would be restricted in areas along the national seashore where SAV beds have been documented. Negligible to minor adverse effects could occur to SAV communities if they spread into areas designated for PWC and other marine watercraft uses. Closing areas in Sinepuxent Bay within the national seashore boundary to PWC use would have potential beneficial effects on SAV communities by creating a buffer between the beds and the PWC use area.

**Conclusion.** Impacts to SAV communities resulting from PWC use in the northern and southern landing areas would be negligible and beneficial in the area of Sinepuxent Bay closed to PWC use.

Cumulative impacts to SAV communities would be negligible to potentially minor in designated use areas and beneficial in Sinepuxent Bay due to prohibiting PWC use and the resultant creation of a buffer between existing SAV beds and PWC use areas.

No impairment to SAV communities is expected to occur.

#### **Impacts of Alternative C — Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions**

**Analysis.** Alternative C would allow PWC use only at the two landing areas in the northern and southern ends of the island, but operators would have to travel at no-wake speeds (maximum 6 mph) when accessing landing points within the seashore boundary. Negligible direct impacts to SAV communities are expected, similar to those described for alternative B. Based on surveys conducted by the Virginia Institute of Marine Science, there are no SAV beds in the immediate vicinity of the northern or the southern PWC landing areas. Direct impacts to submerged aquatic vegetation could occur from PWC use in shallow areas where beds have not been delineated. Additional negligible impacts could result from the settling of suspended sediments on plants following suspension by PWC use in shallow waters. Restricting PWC use to the northern and southern landing areas and implementing no-wake zones would minimize potential for mechanical removal of submerged vegetation in areas that have not been delineated.

**Cumulative Impacts.** Cumulative impacts to SAV communities are expected to be negligible because PWC and other watercraft use would be restricted to areas outside the national seashore and outside areas where SAV are documented to occur. Negligible to minor adverse effects could occur to SAV beds if they spread into areas that are designated for PWC and other marine watercraft uses.

**Conclusion.** Impacts to SAV communities resulting from PWC use in designated areas would be negligible in the northern and southern landing areas and beneficial in Sinepuxent Bay. Restricting PWC use to the northern and southern landing areas and implementing no-wake zones would minimize the potential for impacts on submerged vegetation in areas that have not been delineated.

Cumulative impacts to SAV are expected to be negligible because PWC and other watercraft use would be restricted to areas outside the national seashore and outside areas where SAV communities are documented.

No impairment to SAV communities due to PWC use is expected under alternative C.

### **Impacts of the No-Action Alternative**

**Analysis.** Beneficial impacts to SAV communities are expected under the no-action alternative because this vegetation would no longer be subject to impacts from PWC use within national seashore boundaries.

**Cumulative Impacts.** Negligible cumulative impacts to SAV occurring within the boundaries of the national seashore are expected under the no-action alternative. Although PWC use would be eliminated within the national seashore boundaries, other watercraft would still be able to access some areas, with the potential to adversely impact SAV communities as a result of mechanical removal or the settling of suspended sediments caused by vessel operation in shallow water areas.

**Conclusion.** Eliminating PWC use within the national seashore boundaries would ensure that SAV communities would no longer be impacted by such use. Benefits would be greatest in the areas of known SAV communities in the Sinepuxent Bay area of the seashore and potential non-delineated beds at other locations along the national seashore.

Negligible cumulative impacts to SAV beds occurring within national seashore boundaries are expected as long as conventional watercraft continue to operate within some areas of the national seashore.

No impairment to SAV communities is expected.

## **VISITOR USE AND EXPERIENCE**

### **GUIDING REGULATIONS AND POLICIES**

National Park Service *Management Policies* state that enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks and that the National Park Service is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. Because many forms of recreation do not require a national park setting, the National Park Service will therefore:

- Provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the parks.

- Defer to local, state, and other federal agencies; private industry; and non- governmental organizations to meet the broader spectrum of recreational needs and demands.

Unless mandated by statute, the National Park Service will not allow visitors to conduct activities that:

- Would impair park resources or values;

- Create an unsafe or unhealthful environment for other visitors or employees;

Are contrary to the purposes for which the park was established; or

Unreasonably interfere with the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park; National Park Service interpretive, visitor service, administrative, or other activities; National Park Service concessionaire or contractor operations or services; or other existing, appropriate park uses.

Part of the purpose of Assateague Island National Seashore is to offer opportunities for recreation, education, inspiration, and enjoyment. Its significance lies in that the national seashore provides a protected enclave for complex plant and animal communities, both terrestrial and aquatic, which characterize the Mid-Atlantic Coast, and fully illustrates the natural processes of change which shape the coastal environment. One of the park mission goals is to ensure “visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.” To achieve this, two long-term visitor goals (5 years) were identified in the *Strategic Plan*:

*Visitor Satisfaction* — By September 30, 2005, 93% of visitors to Assateague Island National Seashore are satisfied with appropriate park facilities, services and recreational opportunities.

*Visitor Safety* — By September 30, 2005, the number of Assateague Island National Seashore visitor accidents/incidents reduced from FY1992-FY1996 five-year annual average of 6.72 to 6.05 (10% reduction).

Both goals focus on maintaining high visitor satisfaction via appropriate and safe recreational opportunities and experiences.

## **METHODOLOGIES AND ASSUMPTIONS**

The purpose of this impact analysis was to determine if the use of personal watercraft at Assateague Island National Seashore is compatible or in conflict with the purpose of the park, its visitor experience goals, and the direction provided by National Park Service *Management Policies*. Thus, these policies and goals were integrated into the impact thresholds.

To determine impacts, the current level of PWC use was calculated at locations throughout the park where personal watercraft activity is known to occur. Other recreational activities and the type of visitor experience that is proposed in these locations were also identified. Visitor surveys (if available) and staff observations were also evaluated to determine visitor attitudes and satisfaction in areas where personal watercraft are encountered.

Baseline visitor survey data at Assateague Island National Seashore suggests that the vast majority of visitors are satisfied with their current experience. The potential for change in visitor experience was evaluated by identifying projected increases or decreases in both PWC and other visitor uses, and determining whether these projected changes would affect the desired visitor experience and result in greater safety concerns or additional user conflicts.

## **STUDY AREA**

In terms of PWC use, the appropriate boundary for analyzing visitor experience impacts include the locations related to personal watercraft operation and the distance that personal watercraft noise

travels. Personal watercraft are allowed to operate within the three designated areas: the Ocean City Inlet landing area, Sinepuxent Bay, and the Little Beach landing area. Personal watercraft noise can travel inland, and is expected to dissipate significantly within 0.75 miles of the source. Thus, the study area for visitor experience is Assateague Island National Seashore's northern end from the Ocean City Inlet to the SR 611 bridge and from Little Beach inland 0.75 miles.

### **IMPACT OF PWC ON VISITOR EXPERIENCE GOALS**

The following thresholds were defined:

*Negligible:* Visitors would not likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources.

*Minor:* Visitors would likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources; however the changes in visitor use and experience would be slight and likely short-term. Other areas in the park remain available for similar visitor experience and use without derogation of park resources and values.

*Moderate:* Visitors would be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor use and experience would be readily apparent and likely long-term. Other areas in the park remain available for similar visitor experience and use without derogation of park resources and values, but visitor satisfaction may be measurably affected (either satisfied or dissatisfied). Some visitors, who desire to continue their use and enjoyment of the activity/visitor experience would be required to pursue their choice in other available local or regional areas.

*Major:* Visitors would be highly aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor use and experience would be readily apparent and long-term. The change in visitor use and experience proposed in the alternative would preclude future generations of some visitors' enjoyment of park resources and values. Some visitors, who desire to continue their use and enjoyment of the activity/visitor experience would be required to pursue their choice in other available local or regional areas.

### **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** *Impacts on PWC Users* — Under alternative A approximately eight PWC users would be present on an hourly basis during the peak season in the Ocean City Inlet, five in Sinepuxent Bay, and two at Little Beach. PWC operation would be prohibited throughout the remainder of the national seashore. There would be little or no noticeable change on the experience or satisfaction of PWC users, since restrictions would continue to allow access to the park and personal watercraft activity outside park boundaries. Under this alternative, visitors who use personal watercraft at Assateague Island National Seashore would experience negligible adverse impacts.

*Impacts on Other Boaters* — Other boaters to Assateague Island National Seashore would continue to interact with PWC operators on a limited basis within Sinepuxent Bay, and interactions would likely continue in the Ocean City Inlet and at the southern end of the island. A survey revealed that many visitors are concerned with noise, safety, and disturbance to fishing areas from PWC use. A survey of recreational boaters within and adjacent to the national seashore reported a high frequency of conflicts between the boating public and PWC users. Problems reported include the presence of PWC users in

fishing areas, noise, PWC users operating too close to anchored boats, and excessive speed (University of Delaware 2000). About 75% of boating activity is concentrated at the north end of the island (C. Zimmerman, NPS, pers. comm., Oct. 17, 2001). Based on this analysis, alternative A would have minor adverse effects on the visitor experience of other boaters.

*Impact on Visitors Arriving by Car* — National seashore visitors would continue to be dispersed along the oceanside shoreline, along hiking trails, at Little Beach, in backcountry camping areas, and within NPS jurisdictional waters in nonmotorized watercraft. Swimmers, hikers, and other visitors to the north end of the island, Tom's Cove, and the hiking trails to the south would have slightly more contact with PWC operators and/or be aware of PWC use in the area than visitors to the oceanside of the park. The number of PWC users is expected to increase from 2002 and 2012 by only one to two machines in each use area. The increased amount of contact would not be noticeable when compared to existing conditions. Noise generated by personal watercraft would reach visitors to the marshes and hiking trails at the southern end of the island. Based on this analysis, PWC activity under alternative A would have a negligible to moderate adverse impact on the experience of swimmers, hikers, and other visitors, depending on seasonal variations in visitor activity. Effects to park visitors would be negligible during off season or nonpeak hours (weekdays) with the reduction in PWC use; however, impacts to visitor experience, specifically birdwatching, would be moderate adverse towards the end of the season when the first waves of migratory birds begin to arrive at the island and when PWC users are still present.

**Cumulative Impacts.** The location and number of other boats and proximity to other visitors would affect visitor experiences. Motorized boats would continue to be present within the national seashore. No change to other park visitors and activities would result under this alternative. No other actions are planned that would affect PWC use or visitor experiences within the national seashore. Cumulative impacts related to personal watercraft, other boats, and visitors on the visitor experience would be negligible adverse, since there would be little noticeable change in the visitor experience from existing conditions. Most visitors would continue to be satisfied with their experiences at Assateague Island.

**Conclusion.** Continued PWC use within the national seashore would result in negligible to moderate adverse impacts on the visitor experience, depending on location and seasonal variations in visitor use. At Little Beach there would be a moderate adverse impact between PWC users, birdwatchers, and fishermen during the peak summer months. Conflicts with other boaters, fishermen, and swimmers would continue adjacent to the Ocean City Inlet, and south of the jetty. Alternative A would partially meet the NPS commitment to provide an atmosphere of peace and tranquillity and to maintain the natural soundscape by continuing to restrict PWC use outside the three designated areas. Additionally, alternative A would partially meet the park's strategic goal for improved visitor satisfaction through these same restrictions.

Cumulative impacts related to all other watercraft and other visitors would continue to result in negligible adverse impacts, since there would be little noticeable change in the visitor experience. Most visitors would continue to be satisfied with their experiences at Assateague Island National Seashore.

### **Impacts of Alternative B — Continue PWC Use under a Special Regulation, but Limit Area of Use**

**Analysis.** This alternative would be the same as alternative A except an additional geographic restriction on PWC use would be implemented. The open area in Sinepuxent Bay between the seashore boundary and the SAV buoy line would be closed to PWC use.

*Impact on PWC users* — Impacts to PWC users would be the same as alternative A, except no use would be allowed in Sinepuxent Bay. Although PWC users would not be allowed to ride within the national seashore boundary, access to the bay outside the boundary would continue. PWC users would probably notice little or no change in their experiences or satisfaction, since restrictions would allow for continued access to the park and PWC activity outside the national seashore boundary. Under this alternative, PWC users would experience negligible to minor adverse impacts with the closure of Sinepuxent Bay to such use.

*Impact on Other Boaters* — Other boaters to Assateague Island National Seashore would continue to interact with PWC operators on a limited basis; however, these interactions would be limited to the landing areas at Ocean City Inlet and Little Beach within park jurisdictional waters. The implementation of alternative B would eliminate the potential for visitor conflict due to PWC use in the Sinepuxent Bay park boundary waters; however, a large percentage of recreational boaters use the northern end of the park, and this is an area of concentrated complaints. Based on this analysis, alternative B would have minor adverse effects on the visitor experience of other boaters now and in the future.

*Impact on Visitors Arriving by Car* — Implementation of this alternative would have the same effect as alternative A; however, there would be a reduction in potential impacts to visitors along the shoreline of Sinepuxent Bay. The effects to park visitors would continue to be negligible during the off season or nonpeak hours (weekdays); however, impacts to visitor experience, specifically birdwatching, would be moderate adverse towards the end of the season, when the first waves of migratory birds begin to show their presence at the southern end of the island and PWC users are still present.

**Cumulative Impacts.** Cumulative impacts would be similar to those described for alternative A. The location and number of other boats and their proximity to other visitors would affect visitor experiences. Motorboat use would continue within the national seashore park boundary; however, prohibiting PWC use within Sinepuxent Bay would remove PWC-related impacts in this area. Cumulative impacts on visitor experiences related to PWC and other boat uses would be negligible adverse, since there would be little noticeable change in recreational opportunities. Most visitors would continue to be satisfied with their experience at Assateague Island National Seashore.

**Conclusion.** Continued PWC use would result in negligible to moderate adverse impacts on visitor experience, depending on location and seasonal variations in visitor use, as described for alternative A. At Little Beach there would be a moderate adverse impact between PWC users, birdwatchers, and fishermen during the peak summer months. Alternative B would partially meet the NPS commitment to provide an atmosphere of peace and tranquillity and to maintain the natural soundscape by restricting PWC use to the two landing areas at the north and south ends of the island. Also, alternative B would partially meet the seashore's strategic goal for improved visitor satisfaction through these same restrictions, improving visitor satisfaction in the area of Sinepuxent Bay where there have been some visitor complaints related to fishing and PWC use.

Cumulative effects would continue to result in negligible adverse impacts, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences at the national seashore. PWC-related impacts would be removed from Sinepuxent Bay, but other uses would continue in this area.

### **Impacts of Alternative C — Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions**

**Analysis.** This alternative is the same as alternative B except a no-wake zone would be implemented within the park boundary at the two landing areas. The open area in Sinepuxent Bay between the seashore boundary and the SAV buoy line would be closed to PWC use.

*Impact on PWC users* — Impacts to PWC users would be similar to alternative B. Although PWC users would be banned from Sinepuxent Bay within the park boundary and no-wake zones would be implemented, the park would remain accessible to PWC users. However, some users may reduce their use of Assateague Island National Seashore waters as a result of the no-wake zones. Under this alternative, visitors who use personal watercraft at Assateague Island National Seashore would experience negligible to minor adverse impacts.

*Impact on Other Boaters* — Other boaters to Assateague Island National Seashore would continue to interact with personal watercraft operators on a limited basis; however, these interactions would be limited to the landing areas at Ocean City Inlet and Little Beach within park jurisdictional waters. The implementation of alternative C would reduce potential impacts to visitor experience by reducing potential conflicts between PWC users and other recreational boaters. Based on this analysis, the implementation of alternative C would have negligible adverse effects and beneficial effects on the visitor experience of other boaters, for the existing and future conditions.

*Impact on Visitors Accessing the Park by Car* — Implementation of this alternative would have the same effect as alternative B; however, there would be a reduction in potential impacts to visitors along the shoreline of Sinepuxent Bay and at the two landing areas. The effects to park visitors would continue to be negligible during off season or nonpeak hours (weekdays) and would be reduced during the peak PWC use times. Therefore, the implementation of alternative C would have negligible to minor adverse effects on the visitor experience of other visitors to the park.

**Cumulative Impacts.** Cumulative impacts would be similar to those described for alternative B. The location and number of other boats and proximity to other visitors affect visitor experience. Motorized boats would continue to be present within the park boundary; however, the potential for PWC use to affect visitor experience would be reduced within the park boundary. Cumulative impacts related to personal watercraft, other boats, and visitors would be negligible adverse, since there would be little noticeable change in the visitor experience. Most visitors would continue to be satisfied with their experience at Assateague Island National Seashore.

**Conclusion.** Alternative C would reduce impacts to the experience of visitors other than PWC users to negligible to minor. There would be a negligible to minor adverse impact to PWC users as a consequence of the no-wake zone speed limits. However, PWC user access to the national seashore would remain.

Similar to alternative A, cumulative impacts related to personal watercraft, other boats, and visitors would be negligible, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences at the national seashore.

### **Impacts of the No-Action Alternative**

**Analysis.** Prohibiting PWC use within Assateague Island National Seashore would preclude this activity by a small number of visitors, adversely affecting their experiences. Some conflicts between

fishermen and sailboats would still occur because personal watercraft could still be used immediately outside national seashore boundaries. Surveys conducted by the National Park Service revealed that approximately 97% of the visitors (out of 83 survey respondents) were satisfied with their experiences. However, sampling was not conducted at the two designated landing areas on the island, so the survey may not be representative of visitors who were in close contact to PWC use. Some beneficial impacts are expected in areas that were open to PWC use since there would be no PWC-related conflict with other visitors.

**Cumulative Impacts.** No adverse cumulative impacts within the national seashore boundary are expected. Banning PWC use within NPS jurisdictional water could encourage users to frequent waters used by others (e.g., other boaters), creating a minor adverse cumulative impact in those areas.

**Conclusion.** Impacts to visitor experiences would be reduced to negligible levels for non-PWC users and would remain minor for PWC users as they would be required to go elsewhere.

No adverse cumulative impacts within the national seashore boundary are expected. Banning PWC use within NPS jurisdictional water could encourage users to frequent waters used by others (e.g., other boaters), creating a minor adverse cumulative impact in those areas.

## VISITOR SAFETY

### GUIDING REGULATIONS AND POLICIES

In addition to the guiding regulations and policies discussed for “Visitor Experience,” the National Park Service *Management Policies 2001* state that the National Park Service is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. *Director’s Order #9 (DO-9)*, and its accompanying reference manual, establish and define standards and procedures for NPS law enforcement. Along with education and resource management, law enforcement is an important tool in achieving the National Park Service’s mission. Commissioned employees perform resource stewardship, education, and visitor use management activities, including law enforcement. They provide for tranquil, sustainable use and enjoyment of park resources, while simultaneously protecting these resources from all forms of degradation. The objectives of the law enforcement program are (1) to prevent criminal activities through resource education, public safety efforts, and deterrence, (2) to detect and investigate criminal activity, and (3) to apprehend and successfully prosecute criminal violators. The NPS *Management Policies 2001* (sec. 8.2.5.1) state, “While recognizing that there are limitation on its capability to totally eliminate all hazards, the Service and its concessioners, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees.” Further, the National Park Service will strive to protect human life and provide for injury-free visits (*Management Policies 2001*, sec. 8.2.5).

In both Maryland and Virginia, PWC users are required to comply with all federal boating laws and regulations. In addition to these requirements, the owner/operator may be required to comply with additional regulations and/or laws specific to the state in which the vessel is registered or operated. Both Maryland and Virginia have established their own laws and regulations (see Table 11, page 78).

Specific safety consideration in the Maryland boating laws include that (1) on state waters a personal watercraft may not be operated faster than 6 knots within 100 feet of any shore, wharf, pier, bridge abutment, or persons in the water; (2) on Maryland waters in the Atlantic Ocean, a personal watercraft may not be operated within 300 feet of persons in the water or surf fisherman; (3) a personal watercraft may not be operated faster than 6 knots within 100 feet of another vessel except in a



crossing or overtaking situation, as described in the “Federal Rules on the Road;” and (4) a personal watercraft may not be operated in a negligent manner.

Virginia legislation requires that (1) a personal watercraft may not be operated faster than a “no-wake” speed when within 50 feet or less of docks, piers, boathouses, boat ramps, people in the water, and vessels other than personal watercraft; and (2) a personal watercraft may not be operated recklessly or at a speed or in such a manner to endanger the life, limb or property of any person, including (a) weaving through vessels that are underway, stopped, moored, or at anchor while exceeding a reasonable speed under the circumstances and traffic conditions existing at the time; (b) following another vessel or person on water skis or similar device, crossing the path of another vessel, or jumping the wake of another vessel more closely than is reasonable and prudent, having due regard to speed of both vessels and the traffic on and the conditions of the water at that time; (c) crossing between the towing vessel and a person on water skis or other device; or (d) steering toward an object or person and turning sharply in close proximity to such object or person in order to spray or attempt to spray the object or person with the wash or jet spray of the personal watercraft.

National Park Service, within the boundaries of Assateague Island National Seashore, has jurisdiction over the waters in the states of Maryland and Virginia. Based on concurrent jurisdiction agreements signed with the Maryland and Virginia, the National Park Service Park Rangers enforce the regulations listed above (pers. comm., Oct. 18, 2001, NPS).

## **METHODOLOGY AND ASSUMPTIONS**

The methodology for visitor safety is similar to that used for “Visitor Experience.” The potential visitor-related impacts attributable to personal watercraft — higher rate of accidents than other watercraft and safety conflicts with other park users — could potentially affect the mandate to provide for injury-free visits.

As described in the “Affected Environment,” Maryland and Virginia have PWC regulations in place, and these enforced within the national seashore (see Table 11). These regulations govern PWC activities near the shore, the timing of PWC use, and the age and educational requirements of operators.

## **STUDY AREA**

In terms of PWC use, the appropriate boundary for analyzing visitor safety impacts include the locations related to personal watercraft operation. Personal watercraft are allowed to operate within the three designated areas: the Ocean City Inlet landing area, Sinepuxent Bay, and the Little Beach landing area. Personal watercraft noise can travel inland, and is expected to dissipate significantly within 0.75 miles of the source. Thus, the study area for visitor experience is Assateague Island National Seashore’s northern end from the Ocean City Inlet to the SR 611 bridge and from Little Beach inland 0.75 miles.

## **IMPACT TO VISITOR SAFETY FROM PWC USE**

The impact intensities for both visitor safety follow. Where impacts or visitor safety becomes moderate or minor, it is assumed that current visitor satisfaction and safety levels would begin to decline and the park would not be achieving some of its long-term visitor goals.

*Negligible:* The impact to visitor safety would not be measurable or perceptible.

*Minor:* The impact to visitor safety would be measurable or perceptible, but it would be limited to a relatively small number of visitors at localized areas. Impacts to visitor safety might be realized through a minor increase in the potential for visitor conflicts in current accident areas.

*Moderate:* The impact to visitor safety would be sufficient to cause a change in accident rates at existing low accident locations or create the potential for additional visitor conflicts in areas that currently do not exhibit noticeable accident trends.

*Major:* The impact to visitor safety would be substantial. Accident rates in areas usually limited to low accident potential expected to substantially increase in the short and long term.

A University of Delaware survey revealed that many visitors are concerned with noise, safety, and disturbance to fishing areas in the vicinity of Assateague Island National Seashore (University of Delaware 2000). The park has received 205 letters, e-mails, and comments documenting visitor concerns about PWC use at the park. Among the documented comments, 143 support and 58 letters oppose a ban on PWC use at the national seashore.

### **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** Under this alternative national seashore waters would continue to be closed to PWC use except in the Ocean City Inlet on the north end of the island, in the vicinity of Little Beach on the south end, and in the area between the SAV buoys and the seashore boundary in Sinepuxent Bay. Impacts resulting from alternative A would have negligible to minor impacts on visitor conflicts and safety in areas where PWC use is allowed.

The primary visitor safety issue at Assateague Island is localized to areas where other visitors may perceive PWC use as an intrusion or nuisance, thereby disrupting their experience. Because personal watercraft can reach speeds up to 70 mph, access shallow water areas, and create wakes, they pose a safety hazard to other users, such as canoeists and kayakers. The majority of visitor conflicts occur on the north end of the island, where visitor use is more intensive along the bayside and oceanside beaches. However, on the northern end, the established landing area is primarily used as a PWC landing area. Conflicts occur between boaters and personal watercraft outside the park boundary. Within the boundary, conflicts typically occur between PWC users and swimmers, fishermen, and surfers (C. Zimmerman, NPS, pers. comm., Oct. 18 2001).

*Personal Watercraft/Swimmer Conflict* — Potential accidents involving PWC users and swimmers may occur in nearshore waters in the extreme northeast and northwest sections of the national seashore adjacent to the PWC landing area (most swimmers do not venture farther than 200 feet from shore). However, due to the small number of visitors utilizing this area (in comparison to the heavily populated guarded beaches at the state park), adverse impacts would likely continue at a minor to moderate level. Potential conflicts within Sinepuxent Bay would be between PWC users. In the southern end of the island at Little Beach, potential accidents could occur involving PWC users and swimmers. The number of PWC users in this area is more limited than in the northern end of the island. Consequently, potential adverse impacts to swimmers at Little Beach are considered to be negligible to minor.

*Personal Watercraft/Other Boat Conflicts* — The potential for accidents with boaters (canoes, kayaks, sailboats, and motorboats) in the Ocean City Inlet and Sinepuxent Bay are considered to be of a minor to moderate level due to the level of activity. The high speed capabilities of personal watercraft pose threats to the safety of the PWC operator and vessels that are harder to maneuver, such as sailboats, canoes, and kayaks. Because of the level of activity at the Ocean City Inlet, the potential for accidents with boaters is considered moderate. However, the areas proposed to remain open to PWC use would be generally defined as transportation corridors, and over time and with sufficient enforcement of state boating law, visitors would come to use them as access lanes to legal landing areas rather than PWC use areas, resulting in a reduced potential for accidents. This would be more evident in the Ocean City Inlet, where traffic is heavy. Most canoers/kayakers do not venture into the inlet because of the heavy vessel congestion, but they do frequent waters adjacent to the inlet both inside and outside the national seashore where PWC users operate. In Sinepuxent Bay the waters are calmer and attract a wide variety of boaters, including kayakers. Although the area where boaters can operate is much wider than at Ocean City Inlet, higher numbers of boaters operating in these waters in recent years increase the possibility of accidents with PWC users, and the impact to visitor safety would be considered moderate.

**Cumulative Impacts.** Cumulative impacts under alternative A would continue at minor to potentially moderate levels over the next 10 years as congestion increases (see Table 15). As the number of all kinds of motorized watercraft continues to increase, the potential for accidents would escalate as well. This would occur particularly in the Ocean City Inlet and Sinepuxent Bay, where the potential for accidents between personal watercraft and other motorboats exists.

**Conclusion.** Although the number of PWC users is not expected to substantially increase over the next 10 years, alternative A would result in negligible to moderate adverse impacts as congestion (created by all boat types) increased. The capability of NPS staff to enforce boating laws would depend directly on the presence of patrols in use areas. Consequently, the potential for long-term impacts to visitor safety (potential conflict between PWC users and swimmers and/or boaters) would be substantial and considered to be a moderate adverse impact.

### **Impacts of Alternative B — Continue PWC Use under a Special Regulation, but Limit Area of Use**

**Analysis.** Alternative B would result in similar impacts to those mentioned in alternative A, but the potential for impacts to visitor safety resulting from PWC use would be eliminated in the Sinepuxent Bay since PWC use would be prohibited in this area.

**Cumulative Impacts.** Cumulative impacts would be similar to those described for alternative A, except impacts related to PWC use would be reduced within Sinepuxent Bay. Again, depending on the type of activity and its location, potential impacts to visitor safety would range from negligible to minor, but any accidents would likely be unique in nature. Cumulative minor adverse impacts to areas of Sinepuxent Bay outside national seashore boundaries would likely increase as PWC users would concentrate their activities in those areas as a consequence of Sinepuxent Bay within the national seashore being closed to PWC use.

**Conclusion.** Alternative B would eliminate the potential for PWC-related accidents within the Sinepuxent Bay area of the national seashore to negligible. At the northern and southern landing areas, existing conditions would continue, with negligible to moderate adverse impacts to visitor safety.

**Impacts of Alternative C — Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions**

**Analysis.** Similar to alternative B, alternative C would allow PWC use only at the two landing areas at the northern and southern ends of the island. However, in addition PWC users would have to comply with a no-wake provision (maximum 6 mph speeds) when accessing landing points within the seashore boundary. This restriction would limit using personal watercraft as a recreational vehicle in this area and favor its use as a transport vehicle from point A to point B.

Alternative C would result in similar types of impacts as those described for alternative B, but it would add additional regulations enforcing no-wake compliance within national seashore boundaries. The potential for impacts to visitor safety resulting from PWC use would be eliminated in Sinepuxent Bay and would be further reduced at the landing areas because of the no-wake requirement. Swimmers at Little Beach would see their safety increased under this alternative. Boaters using waters outside the national seashore could be adversely affected because of probable increased PWC use in deeper waters.

**Cumulative Impacts.** Depending on the type of activity and its location, potential cumulative impacts to visitor safety would be negligible, but any accidents would likely be rare in nature

**Conclusion.** Alternative C would eliminate the potential for PWC-related accidents within the Sinepuxent Bay area of the national seashore. No-wake restrictions at the northern and southern landing areas would reduce the potential for accidents in these areas to negligible or possibly minor. An increased potential for accidents between PWC users and other boaters could occur in the Ocean City Inlet and Sinepuxent Bay outside NPS waters; this impact would be considered negligible to minor.

**Impacts of the No-Action Alternative**

**Analysis.** Impacts associated with visitor safety and PWC use within the national seashore would be eliminated. Eliminating PWC use at the landing areas would further decrease the potential for accidents with other park visitors. Those visitors who use these areas for swimming, fishing, and traditional boating would benefit from the prohibition of PWC use. However, visitors to the park that utilize non-NPS waters could experience an increased adverse effect on their safety, particularly in the Ocean City inlet area and at Sinepuxent Bay (non-park waters).

Prohibiting PWC use at the landing areas would further decrease the potential for conflict with other park visitors. Those visitors who use this area of the park for swimming, fishing, and surfing would experience minor benefits from the elimination of personal watercraft in the area.

**Cumulative Impacts.** Other recreational activities in the park have the potential to affect visitor safety. Depending on the type of activity and its location, potential impacts to visitor safety may range from negligible to minor, but any accidents would likely be unique in nature. Closure of Assateague Island National Seashore to PWC use may create a condition where PWC users would utilize non-park waters for recreation. Such is the case with the Ocean City Inlet and Sinepuxent Bay areas. This would create an increase in cumulative impacts to safety (accidents with other boaters) in those waters

**Conclusion.** Because many of the other uses in the national seashore are related to motorized watercraft and water-related activities, the potential for accidents is always present, therefore the overall reduction in accident potential resulting from banning PWC use would be negligible to minor. This alternative would result in negligible impacts to visitor safety from PWC use. This is due to the

potential for increased safety hazards to other boaters operating in adjacent non-NPS waters with a possible increase in PWC activities in those areas.

## **SOCIOECONOMIC EFFECTS**

### **ECONOMIC IMPACT ANALYSIS**

PWC use is a popular recreational activity along beaches in Maryland and Virginia. However, many PWC users in Assateague Island National Seashore are not visiting the seashore as a destination. Instead, they are often passing through the national seashore on their way to other locations. One estimate of PWC use suggests that over 2,000 PWC users enter the national seashore annually. NPS staff estimate that approximately 90% of PWC use within the seashore boundary occurs adjacent to the 6-mile long northern end of the island, consisting of both guided rentals and privately owned machines. Most of the guided rentals originate from Ocean City, where there are 13 liveries that rent PWC units. All PWC renters must be accompanied by a guide in Maryland waters. PWC rental shops in the area usually restrict renters to a specific area in waters adjacent to their shops. Consequently, only those rental shops whose use area overlaps with Assateague Island National Seashore, or those that feature “nature tours” in the national seashore would experience negative impacts from PWC restrictions. At least four of the rental companies in Ocean City conduct PWC tours to the bayside. At the south end of the island, where PWC use is less frequent, only one company in Chincoteague currently rents personal watercraft. PWC use was not observed to be prevalent in the waters off Chincoteague National Wildlife Refuge, except for some use in the area of Little Beach.

It appears unlikely that a significant number of people would stop visiting the region as a result of new restrictions on PWC use within Assateague Island National Seashore. According to local PWC rental shops, there are alternative PWC use locations outside the national seashore near Ocean City. In fact, local PWC dealerships and rental shops stated that most PWC use occurs in nearby areas north of the seashore. Thus, it is expected that PWC users who might be restricted from being able to ride in the national seashore would likely go to other regional locations, with few choosing to stop visiting the region even if PWC use in the national seashore was banned. There is no evidence that the PWC use restrictions promulgated by the National Park Service in April 2000 caused any businesses to close. One or two shops may have stopped renting PWC units as a result of the restrictions, but other sources of revenue allowed the businesses to remain open.

Typical renters in Ocean City use personal watercraft as only one component of their vacation. During the peak PWC season (Memorial Day to Labor Day), approximately 4 million people visit Ocean City alone. Given the small expected change in the number of PWC users to the region relative to total regional visitation, it is not expected that any of the alternatives would have a noticeable impact on the total number of visitors to the region. Thus, lodging establishments, restaurants, and other businesses are unlikely to be affected. Overall, no measurable impacts are expected on the regional economy or the communities in which these businesses are located.

Although no measurable regional economic impact due to implementing any of the alternative is expected, there may be some decrease in revenue for PWC dealerships and rental shops, especially under the no-action alternative. Since an analysis of local businesses during January 2002, many of the area businesses related to PWC use were closed. Consequently, only one PWC dealership and two PWC rental shops were successfully contacted. The PWC dealership expressed some concern that any restriction in PWC use could cause a reduction in sales as a result of negative publicity. Of the two rental shops contacted, one proprietor believed that the implementation of alternative C or the no-

action alternative might result in a decline in their PWC rentals, while the other rental shop did not expect any negative impacts associated with PWC restrictions.

## BENEFIT-COST ANALYSIS

The purpose of benefit-cost analysis is to determine whether a proposed action (in this case, the regulation of PWC use in Assateague Island National Seashore) would promote an efficient allocation of resources. That is, whether the proposed action would generate more benefits than costs. These costs and benefits accrue directly to households that use personal watercraft, and indirectly to those who are affected by PWC use (e.g., those who benefit from reduced noise). The resulting changes in PWC use may also impose costs on those who own or work for PWC-related businesses.

Even individuals who do not visit the national seashore can benefit from the knowledge that seashore resources are being protected. In other words, they may hold positive “nonuse” values for protecting the national seashore environment. These nonuse values can stem from a desire to ensure the enjoyment of these resources by others (both current and future generations) or from a sense that these resources have intrinsic value. Evidence of nonuse value for resources like Assateague Island has been established in the economic literature. Restrictions on PWC use in Assateague Island can therefore provide benefits to both users and nonusers in a number of ways by protecting the national seashore’s ecological resources.

For purposes of this analysis, six major affected groups have been identified and listed in the table below, along with the anticipated impacts of the proposed regulatory alternatives. In this table “consumer surplus” is the economic measure of net benefits that accrue to individuals from PWC use and the protection of natural resources. “Producer surplus” is the economic measure of net benefits that accrue to businesses that sell or rent personal watercraft and other related businesses. Producer surplus is generally equivalent to business profit. Increases in consumer surplus and producer surplus represent benefits, while decreases in those measures represent costs.

**TABLE 40: SOCIOECONOMIC IMPACT OF ALTERNATIVES ON USER GROUPS**

User Group	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
PWC Users	No change in consumer surplus.	Consumer surplus is expected to decrease as a result of spatial restrictions on PWC use	Consumer surplus is expected to decrease somewhat more than under alternative B due to spatial restrictions and no-wake zones.	Consumer surplus is expected to decrease more than under alternative C as a result of banning PWC in the national seashore.
Other Visitors or Potential Visitors (canoers, anglers, other boaters, swimmers, hikers and other visitors)	No change in consumer surplus.	Consumer surplus is expected to increase slightly for current users as a result of more solitude in Sinepuxent Bay, improved water quality, and decreased risk of PWC-related accidents. Consumer surplus is expected to increase for new visitors who would not have visited the national seashore without	Consumer surplus is expected to increase for current users similar to alternative B, although the magnitude of the increase might be somewhat greater due to no-wake zones that would slow PWC users near the shore. Consumer surplus is expected to increase for new visitors who would	Consumer surplus is expected to increase for current users similar to alternative C, although the magnitude of the increase might be somewhat greater because PWC use would be banned in the national seashore. Consumer surplus is expected to increase for new visitors who would not have visited without

User Group	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use under a Special Regulation, But Limit Area of Use	Alternative C: Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions	No-Action Alternative
		these PWC use restrictions.	not have visited without these PWC use restrictions slightly more than under alternative B.	these PWC use restrictions somewhat more than under alternative C.
Producers of PWC Services (PWC rental shops, PWC sales shops, other parts of the local economy providing services to PWC users)	No change in producer surplus.	PWC rental and sales shops are not expected to experience a measurable decline in producer surplus. Other parts of the local economy such as hotels, restaurants and gas stations are not expected to have a decrease in producer surplus.	Producer surplus could decrease somewhat for PWC rental shops as a result of a small decline in PWC rentals in the area, especially for those liveries currently providing guided tours that pass through the national seashore. PWC dealerships are not expected to experience a measurable decline in producer surplus. Other parts of the local economy such as hotels, restaurants, and gas stations are not expected to have a substantial decrease in producer surplus.	Producer surplus could decrease for PWC rental shops as a result of a small decline in PWC rentals in the area, especially for those liveries providing guided tours that pass through the seashore. Any decrease would likely be larger than under alternative C. Producer surplus could decrease somewhat for PWC dealerships as a result of a slight decline in sales and servicing of PWC units. Other parts of the local economy such as hotels, restaurants, and gas stations are not expected to have a substantial decrease in producer surplus.
Local Residents	No change in local resident welfare.	No measurable change in local resident welfare expected.	No measurable change in local resident welfare expected.	No measurable change in local resident welfare expected.
Producers of Services for Non-PWC Users	No change in producer surplus.	Producer surplus is expected to increase as PWC use restrictions could increase demand for angling, canoeing, and other activities, resulting in more demand for services related to these activities.	Producer surplus is expected to increase as PWC use restrictions could increase demand for angling, canoeing, and other activities, resulting in more demand for services related to these activities. This increase is not expected to be substantially larger than under alternative B.	Producer surplus is expected to increase as prohibiting PWC use could increase demand for angling, canoeing, and other activities, resulting in more demand for services related to these activities. This increase could be somewhat larger than under alternative B or C.
General Public	No change in welfare.	The general public could experience an increase in welfare as a result of enhanced non-use values resulting from a perception of improved environmental quality in the national seashore.	Similar to alternative B, the general public could experience an increase in welfare as a result of enhanced non-use values resulting from a perception of improved environmental quality in the national seashore.	The general public could experience increased welfare as a result of enhanced non-use values resulting from a perception of improved environmental quality. The increase is expected to be larger than under alternative B or C as a result of prohibiting all PWC use within the national seashore.

This analysis of benefits is qualitative since quantification was not feasible with currently available data. The primary beneficiaries of alternatives B, C, and the no-action alternative would be national

seashore visitors who are not PWC users and whose national seashore experience would be negatively affected by PWC use. In Assateague Island National Seashore, other popular activities include canoeing, fishing, boating, and hiking. Based on 2001 NPS visitation estimates, non-PWC users account for more than 99% of national seashore visitors.

Nonusers of Assateague Island National Seashore are also likely to benefit from the proposed measures. For example, the general public could benefit simply from the perception that the area's natural resources are being better protected. Therefore, some of the benefit categories described below, in particular those associated with the preservation of unique national seashore resources and ecosystems, could accrue in the form of nonuse values.

### **AESTHETIC BENEFITS**

Alternatives that impose restrictions on PWC use would reduce noise levels in the areas where PWC are currently allowed. These restrictions would improve the level of natural quiet along portions of the national seashore. PWC use restrictions would also have the potential to improve visibility by limiting the amount of emissions. However, the large number of motorized boats already operating along the shore would virtually eliminate any aesthetic impacts of restricting PWC use in these areas.

Alternative A, which would continue current policy, would offer no benefits from aesthetic improvements to non-PWC visitors over current conditions. Alternative B would ban the use of PWC in Sinepuxent Bay, resulting in a small reduction in noise, but noise from other boating activities would still affect the bay and remaining areas. Visibility impacts would be negligible. Alternative C would be unlikely to have substantial aesthetic benefits beyond those described for alternative B because of the prevalence of other motorized boats along the shore. The no-action alternative would have the greatest impact because it would ban PWC use throughout the national seashore. However, as described under alternative B, noise from other boating activities would still infiltrate the bay and remaining areas.

Noise emissions have been identified as a particular nuisance to non-motorized visitors, such as canoeists and hikers, who tend to place a particularly high value on the tranquillity and natural soundscapes available in national park system areas. Anglers using motorized boats also value the natural soundscape, and while fishing, often operate their boats with quiet electric motors to avoid disturbing fish. Therefore, reducing PWC-related noise would benefit both motorized and non-motorized visitors. In addition, PWC emission can be bothersome to other visitors and result in reduced visibility. These effects tend to be much more localized than noise emissions. However, visibility impacts from emission reductions due to PWC use restrictions under these alternatives would be negligible.

### **HUMAN HEALTH BENEFITS**

PWC emissions contain relatively high levels of pollutants that are potentially damaging to human health. While the level of PWC use in Assateague Island National Seashore does not represent a health threat to humans, the potential for adverse effects exists. The large number of other motorized watercraft operating in the national seashore would limit the impact of restricting PWC use. In summary, the health benefits from the proposed restrictions are expected to be minor for all of the alternatives.



## **ECOSYSTEM PROTECTION BENEFITS**

PWC use has the potential to negatively affect ecosystems and natural habitats in a variety of ways. In the case of national parks, these natural resources are of particular value to the public. Although current levels of PWC use are not expected to cause widespread ecosystem injuries, restricting PWC use could nonetheless provide benefits to visitors and nonusers by better protecting some of the national seashore's natural resources.

Alternative A would offer no benefits to society for ecosystem protection compared to the current situation. Under alternative B the restrictions on PWC use would not likely result in major benefits though the protection of the national seashore's ecosystem due to the prevalence of other motorized watercraft and the fact that PWC use would still be allowed in the landing areas on the northern and southern ends of the island. Under alternative C the no-wake restriction could help reduce turbidity levels and nearshore loading of contaminants and minimize physical injury. It would also dissuade PWC operators from using these sites. However, the cumulative effect would still be small because of the presence of other motorized watercraft. The no-action alternative would have minimal impacts because other motorized uses would still be allowed, and PWC use would be allowed adjacent to national seashore boundaries.

Fish and wildlife could be adversely affected by the presence of PWC in Assateague Island National Seashore. In addition to being a potential nuisance to other visitors, noise from PWC may disturb wildlife. Localized effects on wildlife would be reduced under alternative B, alternative C, and the no-action alternative because use restrictions would reduce noise disturbance and the chance for collisions with wildlife. There would also be long-term beneficial impact to aquatic biota and ecosystems because of improvements in water quality and a reduction in physical disturbances. Reducing potential harm to Assateague Island's ecosystems would benefit visitors, for example by improving their chances of viewing wildlife in a less stressful environment. It would also provide benefits to individuals across the country who value the National Seashore's unique ecosystems and natural habitats, regardless of whether they actually visit the park

## **SAFETY BENEFITS**

Restrictions on PWC use within Assateague Island National Seashore could also provide benefits in the form of reduced risk of accidents.

Alternative A would offer no other benefits to society related to safety and congestion compared to the current situation. Under alternative B potential benefits include those associated with reductions in the risks of PWC-related safety hazards. If this alternative reduced the number of PWC users in the national seashore, it could benefit all visitors by reducing their risks of being involved in PWC-related accidents. This alternative might also result in an increase in PWC use in areas where the use would still be allowed, increasing congestion and the chance for safety risks in these areas. Alternative C would have other potential benefits in addition to those discussed for alternative B, including those related to the no-wake restriction, which could reduce the potential for accidents in nearshore areas. The no-action alternative would be similar to alternatives B and C, but this alternative would have the potential to reduce PWC-related accidents in Assateague Island National Seashore. However, because congestion might increase in non-park waters, overall potential accidents could increase.

Reducing PWC-related accidents would also reduce NPS costs associated with medical/rescue operations, which would allow these resources to be redirected to other park management activities.

These benefits are likely to be moderate in Assateague Island National Seashore. Safety records from 1992 to 1996 indicate an annual average of 6.72 PWC-related accidents.

### **COSTS TO PWC USERS**

Two groups of PWC users might be affected by the proposed restrictions: PWC users who currently ride in Assateague Island National Seashore and those who ride in other areas outside the national seashore. Users displaced from the national seashore could decide to ride in these other areas if PWC use within NPS boundaries was restricted. For PWC users who currently ride in national seashore waters or who may want to ride there in the future, use restrictions could result in consumer surplus losses. However, to the extent that individuals consider other PWC areas close substitutes to riding in the national seashore, the loss in consumer surplus associated with restricting PWC use in the seashore would be lower. PWC users in nearby areas could lose some consumer surplus if these areas become more crowded due to PWC restrictions within the national seashore.

Under alternative A no change in PWC use is anticipated. Consumer surplus to PWC users would remain unchanged from current conditions. Under alternative B prohibiting PWC use in Sinepuxent Bay could cause PWC users who frequent this area to lose consumer surplus. However, PWC users could still access Sinepuxent Bay west of the seashore boundary, and the seashore could still be accessed by way of the Ocean City Inlet landing area or the Little Beach landing area. Some tour groups take tours in Sinepuxent Bay, but renters could use craft in many substitute areas in the vicinity. Overall, consumer surplus losses would be minimal under this alternative. Under alternative C this alternative would require no-wake speeds in nearshore areas, in addition to closing Sinepuxent Bay to PWC use. This speed reduction would increase the amount of time it would take for PWC users to travel into and of the national seashore, possibly reducing the accessibility of the national seashore, particularly for renters who are charged by the hour. Again, because substitute areas exist nearby, this is not expected to have a substantial effect on PWC use, with minimal to moderate losses in consumer surplus. Under the no-action alternative banning PWC use would mean the PWC riders in the national seashore would lose the full value of their consumer surplus for rides within seashore boundaries, but not in nearby substitute areas.

### **COSTS TO LOCAL AREA BUSINESSES**

If PWC use decreased as a result of the alternatives being considered, then the suppliers of PWC and rental services could be affected. In addition, lodging establishments, restaurants, gas stations, and other businesses that serve PWC users could experience a reduction in business. One firm in Ocean City sells personal watercraft, and there are 14 rental shops. It is unlikely that any alternative would affect all rental shops, since most of the shops in Ocean City do not send group tours to Assateague Island National Seashore. Using interview responses, the following potential annual losses in producer surplus (annual sales estimates and estimated profit margins) are estimated:

<b>Alternative A:</b>	\$0 loss for PWC sales shops	\$0 loss for PWC rental shops
<b>Alternative B:</b>	\$0 loss for PWC sales shops	\$0 loss for PWC rental shops
<b>Alternative C:</b>	\$0 loss for PWC sales shops	\$0–3,530 loss for PWC rental shops
<b>No-action alternative:</b>	\$680–5,180 for PWC sales shops	\$3,170–10,600 for PWC rental shops

PWC users comprise a small fraction of total visitation to Ocean City and Chincoteague. Further, PWC use in Assateague Island National Seashore is already limited to a small area in the park by the

Superintendent's Compendium. Therefore, lodging establishments, restaurants, gas stations, and other businesses that serve PWC users are not likely to experience a reduction in business under any of the alternatives.

## **NATIONAL SEASHORE MANAGEMENT AND OPERATION**

### **IMPACT TO PARK OPERATIONS FROM INCREASED ENFORCEMENT NEEDS**

NPS rangers at Assateague Island National Seashore are responsible for ensuring for the safety of park visitors and the protection of the park resources. These duties include enforcing the PWC use regulations within the national seashore. Due to the increased accident rates and visitor safety conflicts with personal watercraft, additional park staff could be required to enforce standards and limits.

Many citizens in the surrounding local communities support the restrictions in the Park Superintendent's Compendium, and park staff observations indicate that users have become familiar with the restrictions. Enforcement in the Ocean City Inlet is somewhat more difficult due to the density of boat traffic in the inlet. The Maryland Department of Natural Resources, the U.S. Coast Guard, and the Coast Guard Auxiliary are all familiar with the restrictions. The Maryland Department of Natural Resources issues warnings to PWC users who violate the restrictions. The Coast Guard will warn violators but is not likely to issue citations. The Coast Guard Auxiliary helps educate PWC users/violators about the restrictions and occasionally called the U.S. Coast Guard to report violators. On the southern end of the island, the Virginia Marine Patrol provides assistance when needed.

NPS staff make every attempt to have a ranger, in a functional enforcement boat, located in the vicinity of the northern landing area seven days a week from Memorial Day to Labor Day (J. Burns, NPS, pers. comm., Oct. 18, 2001).

Impacts to park operations from increased enforcement needs have been analyzed qualitatively using best professional judgment to define thresholds or the magnitude of impacts.

### **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** Under this alternative national seashore waters would continue to be closed to PWC use except in the Ocean City Inlet on the north end, in the vicinity of Little Beach on the south end, and the area between the SAV markers and the seashore boundary in Sinepuxent Bay.

The proposed PWC use restrictions would require education and enforcement by seashore staff. Enforcement actions would be required to prevent PWC users from entering restricted areas. This could be completed using the existing irregular boat patrols, with the anticipation that PWC users would sometimes operate within the seashore illegally. In order to provide more control on PWC operations, daily boat patrols would be required. This could be accomplished by adding two seasonal staff positions, which would require additional operating funds.

**Cumulative Impacts.** According to seashore staff, existing park operations are not sufficient to adequately monitor and assist current seashore users. Seashore rangers would continue to provide assistance to the various user groups to resolve conflicts as well as ensure safety. Park operations and enforcement needs for these user groups would be the same as under existing conditions, since the number of people and boats would not change under this alternative. Two additional seasonal staff

would be required to meet existing and future (2012) needs. The staffing requirements to implement the PWC restrictions would be adequate for handling cumulative impacts related to park operations.

**Conclusion.** Existing PWC use, as well as existing boat activity, would require additional park staff and funding. Improving park operations to meet existing needs would also be adequate to manage PWC regulations under this alternative.

Impacts under alternative A would be minor to moderate and long term due to existing needs for additional law enforcement capability within the national seashore.

### **Impacts of Alternative B — Continue PWC Use under a Special Regulation, but Limit Area of Use**

**Analysis.** Under this alternative the open area in Sinepuxent Bay between the seashore boundary and the SAV buoy line would be closed to PWC use. This restriction would require education and enforcement by seashore staff to prevent PWC users from entering restricted areas. This could be completed using the existing irregular boat patrols, with the anticipation that PWC users would sometimes operate within the seashore illegally. In order to provide more control on PWC operations, daily boat patrols would be required. This could be accomplished by adding two additional seasonal staff positions, which would require additional park operating funds.

**Cumulative Impacts.** As described for alternative A, existing park operations are not sufficient to adequately monitor and assist current seashore users. Seashore rangers would continue to provide assistance to the various user groups to the park, both to resolve conflicts and to ensure safety. Park operations and enforcement needs for these user groups would be the same as under alternative A, since the number of people and boats would not change under this alternative. Two seasonal staff would be required to meet existing and future (2012) needs. The staffing requirements to implement the PWC restrictions would be adequate for handling cumulative impacts related to park operations.

**Conclusion.** Existing PWC use, as well as existing boat activity, require additional staff and funding. As described for alternative A, improving park operations to meet existing needs would also be adequate to manage PWC regulations under this alternative.

Impacts under alternative B would be minor to moderate and long term due to existing needs for additional law enforcement capability within the national seashore.

### **Impacts of Alternative C — Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions**

**Analysis.** The additional PWC use restrictions under alternative C of requiring no-wake operating speeds in nearshore areas would limit PWC use as a recreational activity in this area and favor its use as a transport vehicle from point A to point B.

The proposed restrictions on personal watercraft operations would require education and enforcement by seashore staff. Enforcement actions would be required to prevent PWC users from entering restricted areas. This could be completed using the existing irregular boat patrols, with the anticipation that personal watercraft would sometimes operate within the seashore illegally. In order to provide more control on PWC operations, daily boat patrols would be required. This could be accomplished by adding two seasonal staff positions, requiring additional park operations funds.

**Cumulative Impacts.** As described for alternative A, existing park operations are inadequate to monitor and assist current seashore users. Seashore rangers would continue to provide assistance to the various user groups to the park. Park operations and enforcement needs for these user groups would be the same as now, since the number of people and boats would not change under this alternative. Two seasonal staff would be required to meet existing and future (2012) needs. The staffing requirements to enforce the PWC use restrictions would be adequate for handling cumulative impacts related to park operations.

**Conclusion.** Existing PWC use, as well as existing boat activity, require additional staff and funding. As described for alternative A, improving park operations to meet existing needs would also be adequate to manage PWC regulations under this alternative.

Impacts under alternative C would be minor to moderate and long term due to existing needs for additional law enforcement capability within the national seashore.

### **Impacts of the No-Action Alternative**

**Analysis.** The no-action alternative would require additional enforcement to ensure that PWC use restrictions within the national seashore boundary were observed. Park staff would be required to enforce these restrictions. Removing personal watercraft, however, would reduce the number of complaints related to user conflict. Park staff would continue to make reasonable efforts to provide for the protection, safety, and security of all park visitors, employees, concessioners, and public and private property, and to protect the natural and cultural resources entrusted to its care. Eliminating PWC use would decrease the potential for accidents in and near the landing areas, but more rangers and boats would be required to enforce the regulations.

**Cumulative Impacts.** Other visitor activities in the park require the presence of enforcement personnel. If visitation numbers increased over time, the need for additional commissioned park rangers would also increase. Depending on park visitation and the ability of the park to hire additional personnel, potential impacts to the enforcement needs of the park would be long-term and could range from negligible to moderate.

**Conclusion.** The no-action alternative would result in minor to moderate, long-term impacts to the enforcement needs of the park resulting from banning PWC use; once the ban was understood and observed by PWC users, impacts would be minor. Because park enforcement capabilities are already taxed, additional enforcement requirements would increase the need for additional personnel.

## **CONFLICT WITH STATE AND LOCAL ORDINANCES AND POLICIES REGARDING PWC USE**

### **Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation**

**Analysis.** PWC use would be managed under current state regulations, which are the same as or less restrictive than Maryland regulations and more stringent than Virginia regulations. Newly adopted Maryland regulations for a no-wake zone in water less than 18 inches deep and limiting PWC use in waters with a depth of less than one meter are more restrictive than NPS regulations. Personal watercraft regulations within the park boundary would not conflict with state and local ordinances and policies regarding use.

**Cumulative Impacts.** Management of PWC use would be consistent with existing state boating regulations, except in those areas where personal watercraft are prohibited. In addition, new Maryland regulations for PWC use would impose additional regulations at the northern landing area and within Sinepuxent Bay beyond the park limitations.

**Conclusion.** PWC and boating regulations within the national seashore boundaries would be the same as or less stringent than Maryland regulations and more stringent than Virginia regulations. Within the Maryland portion of the national seashore additional PWC regulations adopted October 1, 2001, would have negligible adverse impacts on PWC use in these areas. Park regulations under alternative A would have no effect on state and local ordinances.

#### **Impacts of Alternative B — Continue PWC Use under a Special Regulation, but Limit Area of Use**

**Analysis.** Like alternative A, PWC use would be managed under current state regulations within the national seashore boundary. Under this management alternative PWC regulations would be the same as or less restrictive than the newly adopted Maryland state regulations and more stringent than Virginia regulations. PWC regulations within the national seashore would not conflict with state and local ordinances and policies regarding use and would, therefore, have no impact on park management.

**Cumulative Impacts.** As described for alternative A, management of PWC use would be consistent with existing state boating regulations, except in those areas where PWC use is prohibited. In addition, new Maryland PWC regulations would impose additional restrictions at the northern landing area beyond the park limitations.

**Conclusion.** As described for alternative A, PWC and boating regulations would be the same as or less stringent than Maryland regulations and more stringent than Virginia regulations. Within the Maryland portion of the national seashore additional PWC regulations would have negligible adverse impacts on PWC use in these areas. Park regulations would have no effect on state and local ordinances.

#### **Impacts of Alternative C — Continue PWC Use under a Special Regulation, But Limit Area of Use and Implement Other Management Restrictions**

**Analysis.** Like alternative B, PWC user would be managed under current state regulations where PWC use is allowed access within the national seashore boundary. Under this management alternative, PWC regulations would be the same as state regulations in Maryland and more stringent than Virginia regulations. PWC regulations within the park boundary would not conflict with state and local ordinances and policies regarding use and would, therefore, have no impact on park management.

**Cumulative Impacts.** Management of PWC use would be consistent with existing state boating regulations, except in those areas where personal watercraft was prohibited or restricted to no-wake zones.

**Conclusion.** As described for alternative A, PWC and boating regulations would be the same as or less stringent than Maryland regulations and more stringent than Virginia regulations. Within the Maryland portion of the national seashore, new state regulations would have negligible adverse

impacts on PWC use in these areas. Park regulations under alternative A would have no effect on state and local ordinances.

### **Impacts of the No-Action Alternative**

**Analysis.** Because PWC use would no longer be allowed within Assateague Island National Seashore, park regulations would be more restrictive than state or local regulations in either Maryland or Virginia. Maryland and Virginia regulations would no longer be applicable within the national seashore boundaries.

**Cumulative Impacts.** Management of personal watercraft would not affect existing state boating regulations.

**Conclusion.** Because PWC use would no longer be allowed within the national seashore, park regulations would be more restrictive than state or local regulations in either Maryland or Virginia. Park regulations would have no effect on state and local ordinances within the park boundaries.

### **UNAVOIDABLE ADVERSE IMPACTS**

Unavoidable adverse impacts are impacts that cannot be avoided and cannot be mitigated, and therefore would remain throughout the duration of the action. Under any alternative, there would be adverse cumulative impacts if emissions reduced water quality such that standards or criteria would be exceeded. If monitoring indicated that any standard was being exceeded, the impact could be mitigated through the required use of four-stroke engines for both boats and personal watercraft.

The following describes potential adverse impacts related to the implementation of the alternatives.

Under alternatives A and B, the impacts of PWC use and landing on the shoreline of the northern and southern landing zones would be similar. Natural soundscapes would be adversely altered, affecting both wildlife and visitor's experience. Abrupt arrival of a PWC user can produce flight response in waterfowl and other birds present along the shore (disrupting normal nesting, foraging or resting activities), and a negligible to moderate adverse effect on other visitors' experience. Under alternative C and the no-action alternative there would be no unavoidable adverse impacts to the landing areas

Implementation of these alternatives would have minor to moderate adverse effects on aquatic fauna from noise emitted by PWC. Possibly disrupting the potential movement of these organisms into the Ocean City Inlet. Negligible impacts would occur from implementing alternative C.

### **LOSS IN LONG-TERM AVAILABILITY OR PRODUCTIVITY TO ACHIEVE SHORT-TERM GAIN**

As noted above, some resources would be degraded to some extent through implementation of alternatives A and B. None of these resources would be impacted to the degree of "impairment" or long-term permanent loss. Enforcement of existing federal and state laws, and park regulations by Park staff, would likely result in a long-term protection of these resources. These conditions can only be achieved by an increase in rangers and resources (boats) made available to the park.

### **IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES**

Irretrievable commitments of resources are those that cannot be reversed. That is, the commitment of a renewable resource, or the short-term commitment of any resource, takes place for the benefit of an action. As an example, these include the commitment of air quality or water quality by allowing PWC users desiring to continue using the park albeit their emissions of pollutants. Allowing PWC users in the park has resulted in losses of water quality, visitor's experience, and the normal functioning of some species' life cycle. However, taking appropriate mitigation measures against these impacts can reverse the adverse effect on all these committed resources.



# CONSULTATION AND COORDINATION

Consultation and coordination efforts for this planning process focused on the means or processes to be used to include the public; the major interest groups; and local public entities. Based on past experience, park staff place a high priority on meeting the intent of public involvement in the NEPA process and giving the public an opportunity to comment on proposed actions. The staff noted that approximately 70% of the correspondence received regarding the implementation of PWC management strategies in the Park Superintendent's Compendium were in favor of restricting PWC use.

Significant outreach and coordination efforts were conducted while the Park Superintendent's Compendium was developed, including communications with the congressional delegation staff and several meetings with local constituents over a two-year period.

The national seashore has currently been receiving postcards from the membership of a PWC interest group who want to know why other registered vessels that are similar to a PWC unit but are not considered such are being excluded from this action.

The Wilderness Society requested PWC information from the national seashore under the Freedom of Information Act. Other groups are also interested in the PWC issue at the park. The staff has met regularly with the public concerning park management issues. There are three specific goals for the public outreach process and participation plan:

1. Achieve public understanding of the technical and management issues involved.
2. Determine if there are any other new/related issues that have been overlooked.
3. Understand the concerns of groups/individuals that oppose PWC restrictions.

The following agencies, groups, and organizations have been identified as having an interest in this issue as the NEPA process moves forward:

## **Congressional Delegation**

Maryland  
Virginia

## **Federal Agencies**

U.S. Army Corps of Engineers  
U.S. Coast Guard  
U.S. Coast Guard Auxiliary  
United States Fish and Wildlife Service, Chincoteague National Wildlife Refuge

## **State Agencies**

Maryland Conservation Commission  
Maryland Department of Natural Resources, Coastal Bays Program  
Maryland Natural Resource Police  
Virginia Marine Resources Commission

## **Local Agencies**

Accomack County Board of Supervisors  
Worcester County Commission

Town of Chincoteague, Virginia  
Town of Ocean City, Maryland

**Businesses and Organizations**

Assateague Federation of Mobile Sport Fishermen  
Assateague Mobile Sport Fishermen Association  
Biodiversity Legal Foundation  
Bluewater Network  
Chincoteague Bay Foundation  
Chincoteague PWC livery operators  
DELMARVA Low Impact Tourism Experiences, Inc.  
Earth Justice  
Greenpeace  
Izaak Walton League  
Maryland Saltwater Sports Fisherman Association  
Maryland Surfriders – National Surfrider Association Chapter in Ocean City  
Ocean City PWC livery operators  
Ocean Pines Association  
PWIA – Personal Watercraft Industry Association  
Sierra Club  
Wilderness Society  
Worcester and Ocean City Chambers of Commerce  
Worcester Environmental Trust

# **APPENDIX A: PARK SUPERINTENDENT'S COMPENDIUM**

## **Section 1.5 Closures and Public Use Limits:**

Except as otherwise provided in this section, the use of personal watercraft (PWC) is prohibited within the boundary of Assateague Island National Seashore. PWC are prohibited from operating, transiting, launching, or beaching within the established park boundary.

A Personal Watercraft is defined as a vessel usually less than 16 feet in length, which uses an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. PWC are intended to be operated by a person or persons sitting, standing, or kneeling on the vessel, rather than within the confines of the hull. The length is measured from end to end over the deck excluding sheer, meaning a straight line measurement of the overall length from the foremost part of the vessel to the aftermost part of the vessel, measured parallel to the centerline. Bowsprits, bumpkins, rudders, outboard motor brackets, and similar fittings or attachments, are not included in the measurement. Length is stated in feet and inches.

The public use/closure areas are outlined as follows:

### **Ocean City Inlet:**

- PWC may not operate, transit, launch, or beach between the Ocean City inlet channel and the Ocean City inlet south jetty within the established park boundary, to ½ mile offshore.
- PWC may operate, transit, launch, and beach south of the established Ocean City Inlet channel markers from Ocean City Inlet channel Lighted Buoy #10 at latitude 38.19.16N, longitude 75.05.30W, west to Ocean City Inlet channel Lighted Buoy #11 at latitude 38.19.30N, longitude 75.09.0W.

### **Sinepuxent Bay:**

- PWC may not operate, transit, launch, or beach east of the established channel markers from Ocean City inlet channel Lighted Buoy #11, south to Sinepuxent Bay channel Day Beacon #10 at latitude 38.18.02N, longitude 75.06.59W.
- PWC may not operate, transit, launch, or beach east of the established seashore boundary from Sinepuxent Bay channel Day Beacon #10, south to a point of intersection between the established seashore boundary and the line of Submerged Aquatic Vegetation (SAV) closure buoys running southeast from Sinepuxent Bay channel Light #13.
- PWC may not operate, transit, launch, or beach east of the established Submerged Aquatic Vegetation (SAV) closure buoys from the aforementioned point of intersection, south to Verrazano Bridge.

### **Chincoteague Bay:**

- PWC may not operate, transit, launch, or beach east of the established seashore boundary from the Verrazano Bridge south to the Chincoteague Inlet, except as provided for below.

- PWC may operate, transit, launch, or beach east of the established park boundary from Assateague Point north to that portion of Horse Marsh opposite Memorial Park boat ramp. However, PWC are only allowed to access that portion of Chincoteague National Wildlife Refuge designated as “Little Beach.”

**Oceanside:**

- PWC may not operate, transit, or launch west of the established seashore boundary from the Ocean City Inlet jetty south to the Chincoteague Inlet. PWC must remain outside the park boundary, which is ½ mile offshore, at all times.
- PWC are permitted to beach along the ocean side of the island only in emergency situations (injury, mechanical failure, etc).

## APPENDIX B: CONSULTATION REGARDING THREATENED AND ENDANGERED SPECIES



United States Department of the Interior

FISH AND WILDLIFE SERVICE  
Ecological Services  
6669 Short Lane  
Gloucester, VA 23061  
September 25, 2001



Ms. Shannon Cauley  
The Louis Berger Group, Inc.  
1819 H Street, NW, Suite 900  
Washington DC, 20006

Re: Personal Watercraft at Assateague  
Island National Seashore,  
Accomack County, Virginia

Dear Ms. Cauley:

The U.S. Fish and Wildlife Service (Service) has reviewed your August 22, 2001 request for information on federally listed species and sensitive natural resources or ecosystems for the referenced project. You propose four alternatives concerning the use of personal watercraft (PWC) at Assateague Island National Seashore in Accomack County, Virginia. The four alternatives include continuing PWC use under current park management policies; management of PWC use within more restrictive zones; management of PWC use within more restrictive limits, zones, and practices; and eliminating PWC use entirely.

Several federally listed species, including the bald eagle (*Haliaeetus leucocephalus*), piping plover (*Charadrius melodus*), and Delmarva fox squirrel (*Sciurus niger cinereus*) have been documented in the vicinity of the project. However, based on the project description and location, the Service believes that no federally listed or proposed species or their designated critical habitat are likely to be adversely affected by implementation of any of the four alternatives. These comments are submitted in accordance with provisions of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

A yellow-crowned night-heron (*Nyctanassa violacea*) rookery has been documented in the vicinity of the project, north of Black Point Landing. This species, as well as other colonial nesting waterbirds, is protected under the Migratory Bird Treaty Act (MBTA) of 1918 (40 Stat. 755; 16 U.S.C. 703-712). In order to minimize disturbance to rookeries, the Service recommends that no exceptionally loud or disruptive activities should occur within 1,320 feet of the rookery from late March to late July (nesting season). Personal watercraft use has been documented as disruptive to nesting birds; however, this rookery is collocated on a campground and it is not clear whether PWC use would cause additional disruption beyond that of existent camping activity beneath the nesting trees. We suggest you contact the Virginia Department of Game and Inland Fisheries, which has management authority over migratory birds in Virginia, for further information. They may be reached at:

Ms. Cauley

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Virginia Department of Game and Inland Fisheries  
4010 West Broad Street  
P.O. Box 11104  
Richmond, Virginia 23230-11104  
Attention: Tom Wilcox

The Service has these comments regarding the use of PWCs pursuant to the Fish and Wildlife Coordination Act (FWCA) of 1958 (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). PWCs have a shallow draft and high maneuverability not present in larger boats which allows them easy access to ecologically sensitive areas where they have been documented as disturbing nesting birds and other wildlife. The increased wave action generated by the PWCs in shallow water contributes to shoreline erosion. Additionally, at certain depths, the propulsion system utilized by PWCs can uproot aquatic vegetation, displace juvenile fish populations, and stir up bottom sediments which causes a local reduction in the light and oxygen necessary for aquatic life. The Service recommends that PWC use be restricted to the deeper areas of the main channel and not allowed in smaller channels that enter wetlands.

If you have any questions or need further assistance concerning this project, contact Mr. Eric Davis at (804) 693-6694, extension 104.

Sincerely,



for Karen L. Mayne  
Supervisor  
Virginia Field Office

cc: VDCR, DNH, Richmond (Rene Hypes)  
VDGIF, Richmond (Tom Wilcox)



## United States Department of the Interior

### FISH AND WILDLIFE SERVICE

Chesapeake Bay Field Office  
177 Admiral Cochrane Drive  
Annapolis, MD 21401



October 3, 2001

Mr. Shannon R. Cauley  
Senior Ecologist  
The Louis Berger Group, Inc.  
1819 H Street, NW  
Suite 900  
Washington, D.C. 20006

RE: Personal Watercraft (PWC) use at  
Assateague Island National Seashore  
Worcester County, MD

Dear Mr. Cauley:

This responds to your August 22, 2001, request for information on the presence of species which are federally listed or proposed for listing as endangered or threatened within the above referenced project area. We have reviewed the information you enclosed and are providing comments in accordance with Section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

The federally threatened piping plover (*Charadrius melodus*) and the federally threatened seabeach amaranth (*Amaranthus pumilis*) are present within the vicinity of the project. The piping plover nests on the northern end of Assateague Island. Both species may be adversely affected by human activities on their beach or intertidal habitats.

Except for occasional transient individuals, no other federally proposed or listed endangered or threatened species are known to exist within the area. Should additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered.

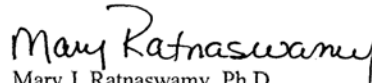
This response relates only to federally protected threatened or endangered species under our jurisdiction. For information on the presence of other rare species, you should contact Lori Byrne of the Maryland Wildlife and Heritage Division at (410) 260-8573.

An additional concern of the Service is wetlands protection. Federal and state partners of the Chesapeake Bay Program have adopted an interim goal of no overall net loss of the basin's

remaining wetlands, and the long term of increasing the quality and quantity of the basin's wetlands resource base. Because of this policy and the functions and values wetlands perform, the Service recommends avoiding wetland impacts. All wetlands within the project area should be identified, and if construction in wetlands proposed, the U.S. Army Corps of Engineers, Baltimore District should be contacted for permit requirements. They can be reached at (410) 962-3670.

We appreciate the opportunity to provide information relative to fish and wildlife issues, and thank you for your interest in these resources. If you have any questions or need further assistance, please contact Andy Moser at (410) 573-4537.

Sincerely,

  
Mary J. Ratnaswamy, Ph.D.  
Program Leader Endangered Species  
Chesapeake Bay Field Office

cc:  
Maryland Wildlife and Heritage Division, Annapolis, MD  
(ATTN: Glenn Therres)





UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
NORTHEAST REGION  
One Blackburn Drive  
Gloucester, MA 01930-2298

Mr. Shannon R. Cauley, Senior Ecologist  
The Louis Berger Group, Inc.  
1819 H Street, NW Suite 900  
Washington, D.C. 20006

SEP 21 2001

Dear Mr. Cauley:

This responds to your inquiry on September 5, 2001, requesting information on the presence of any federally listed, proposed, or candidate threatened or endangered species and/or designated critical habitat for listed species in the vicinity of personal watercraft landing areas on the Assateague Island National Seashore in Maryland and Virginia. It is our understanding that you are preparing an Environmental Assessment, on behalf of the National Park Service (NPS), to determine the potential effects associated with the use of personal watercraft at Assateague Island.

Endangered and threatened sea turtles have been documented in the waters off Assateague Island during the warmer months, generally from May through early November. The species found in the waters off Maryland and Virginia include the endangered Kemp's ridley sea turtle (*Lepidochelys kempii*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), and the threatened loggerhead sea turtle (*Caretta caretta*). While endangered whales (i.e., humpback, right and fin whales) can be found off the Maryland and Virginia coasts in deep waters during certain times of the year, these species are unlikely to be in the vicinity of the personal watercraft landing areas. There is no critical habitat, designated or proposed, for the species referenced above in the specified action area.

Consultation for Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act may be necessary for this project due to the presence of managed species in the project area. Additional information on EFH and the managed species in the proposed project area can be found on the NMFS Habitat Conservation Division web site [<http://www.nero.nmfs.gov/ro/doc/hcd.htm>].

It is also recommended that you also contact the U.S. Fish and Wildlife Service for federally listed threatened or endangered species within their jurisdiction if you have not done so already. The contact number for the Region 5 office is (413) 253-8200.

If you have any questions about these comments or the section 7 consultation process, please contact Carrie McDaniel of my staff at (978) 281-9388.

Sincerely,

Mary Corrigan  
Assistant Regional Administrator  
for Protected Resources

cc: Nichols, F/NER-OXF  
File Code: 1514-05 (A), Section 7 General





**Parris N. Glendening**  
*Governor*

**Maryland Department of Natural Resources**

**J. Charles Fox**  
*Secretary*

**Kathleen Kennedy-Townsend**  
*Lt. Governor*

Tawes State Office Building  
Annapolis, Maryland 21401

**Karen M. White**  
*Deputy Secretary*

October 31, 2001

Mr. Shannon R. Cauley  
The Louis Berger Group, Inc.  
1819 H Street, NW, Suite 900  
Washington, DC 20006

**RE: Environmental Review for U.S. Department of the Interior, National Park Service, Environmental Assessment to Determine Potential Effects Associated with Use of Personal Watercraft (PWC) at Assateague Island National Seashore, Worcester County, Maryland.**

Dear Mr. Cauley:

For the existing PWC Landing Area on Assateague Island National Seashore, the Wildlife and Heritage Division has recent or historical records for the following species of concern known to have occurred on or within the vicinity of the project site:

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Status</u>
<i>Alnus maritima</i>	Seaside alder	Watchlist
<i>Aster concolor</i>	Silvery aster	Endangered
<i>Agalinis fasciculata</i>	Fascicled gerardia	Endangered
<i>Borrichia frutescens</i>	Sea ox-eye	Endangered Extirpated
<i>Buchnera americana</i>	Blue-hearts	Endangered Extirpated
<i>Carex silicea</i>	Sea-beach sedge	Endangered
<i>Charadrius melodus</i>	Piping Plover	Endangered, also federally threatened
<i>Cicindela dorsalis media</i>	White Tiger Beetle	Endangered
<i>Cicindela lepida</i>	Little White Tiger Beetle	Endangered
<i>Coelorachis rugosa</i>	Wrinkled jointgrass	Endangered
<i>Desmodium strictum</i>	Stiff tick-trefoil	Endangered
<i>Eleocharis albida</i>	White spikerush	Endangered
<i>Fimbristylis puberula</i>	Hairy fimbristylis	Status Uncertain
<i>Fundulus luciae</i>	Spotfin Killifish	Rare
<i>Fuirena pumila</i>	Smooth fuirena	Rare
<i>Gymnopogon brevifolius</i>	Broad-leaved beardgrass	Endangered
<i>Honckenya peploides</i>	Sea-beach sandwort	Endangered Extirpated
<i>Leptochloa fascicularis</i>	Long-awned diplachne	Uncertain
<i>Ludwigia hirtella</i>	Hairy ludwigia	Endangered
<i>Panicum flexile</i>	Wiry witch-grass	Endangered

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(Cont'd.)

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Status</u>
<i>Panicum oligosanthos</i>	Few-flowered panicgrass	Rare
<i>Paspalum dissectum</i>	Walter's paspalum	Threatened
<i>Pluchea camphorata</i>	Marsh fleabane	Endangered
<i>Potamogeton pusillus</i>	Slender pondweed	Highly Rare
<i>Prunus maritima</i>	Beach plum	Endangered
<i>Pycnanthemum setosum</i>	Awned mountain-mint	Threatened
<i>Rhynchos niger</i>	Black Skimmer	Threatened
<i>Rhynchospora torreyana</i>	Torrey's beakrush	Threatened
<i>Schwalbea americana</i>	Chaffseed	Endangered Extirpated, also federally endangered
<i>Scleria reticularis</i>	Reticulated nutrush	Rare
<i>Spiranthes odorata</i>	Sweet-scented ladies' tresses	Endangered Extirpated
<i>Spiranthes praecox</i>	Grass-leaved ladies' tresses	Highly Rare
<i>Sterna antillarum</i>	Least Tern	Threatened
<i>Sterna maxima</i>	Royal Tern	Endangered
<i>Sterna sandvicensis</i>	Sandwich Tern	Highly Rare
<i>Triglochin striatum</i>	Three-ribbed arrow-grass	Endangered
<i>Xyris smalliana</i>	Small's yelloweyed-grass	Endangered
<i>Zizaniopsis miliacea</i>	Southern wildrice	Endangered

In addition, there are also the following recent or historical records for species of concern known to occur on or within the vicinity of remainder of the project site (Assateague Island National Seashore):

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Status</u>
<i>Amaranthus pumila</i>	Seabeach Amaranth	Endangered, also Federally Threatened
<i>Ammannia latifolia</i>	Koehne's ammannia	Rare
<i>Aristida tuberculosa</i>	Sea-beach three-awn	Highly Rare
<i>Caretta caretta</i>	Atlantic Loggerhead Turtle	Threatened, also federally threatened
<i>Centella erecta</i>	Coinleaf	Endangered
<i>Charadrius wilsonia</i>	Wilson's Plover	Endangered
<i>Dermochelys coriacea</i>	Atlantic Leatherback Turtle	Endangered, also federally endangered
<i>Eleocharis rostellata</i>	Beaked spikerush	Rare
<i>Eragrostis refracta</i>	Meadow lovegrass	Threatened
<i>Galium hispidulum</i>	Coast bedstraw	Endangered
<i>Panicum flexile</i>	Wiry witch-grass	Endangered
<i>Persea borbonia</i>	Red bay	Endangered
<i>Picoides borealis</i>	Red-cockaded Woodpecker	Endangered Extirpated, also federally endangered
<i>Platanthera cristata</i>	Crested yellow orchid	Threatened
<i>Polygonum glaucum</i>	Seaside knotweed	Endangered
<i>Sacciolepis striata</i>	Sacciolepis	Endangered
<i>Scleria verticillata</i>	Whorled nutrush	Endangered
<i>Sesuvium maritimum</i>	Sea-purslane	Endangered

Much of Assateague Island National Seashore falls within the boundaries of a Natural Heritage Area (NHA). Activities within NHAs are regulated so that the structure and species composition of the area are maintained [COMAR 27.01.09.04.C(2)(b)(vii)].

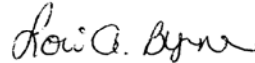
Page 3  
October 31, 2001

There are 24 known active or historical waterbird colonies within the closure area shown on your map. Waterbird colonies are a rare resource that should be protected. Conservation of waterbird colonies that are located outside of the Chesapeake Bay Critical Area is strongly encouraged. Significant mortality of chicks or eggs resulting from disturbance of the colony during the breeding season is a violation of the U.S. Migratory Bird Treaty Act. Waterbirds establish nesting colonies in wetland areas that are relatively predator and disturbance free. Colony sites are usually islands and tidal wetlands. Suitable colony sites are rare, and the Assateague Island area has one of the highest densities of waterbird colonies in Maryland.

Human access to resources critical to the Piping Plover, listed as an Endangered Species in Maryland, by increasing boater access, may have significant negative impacts. State law (§ 10-2A-01/09) requires the Department of Natural Resources and all other units of Maryland state government to take every practical step to conserve listed species. The cumulative impact of continued increases in boating in Maryland's coastal bays also adversely affects colonial nesting waterbirds and migrant shorebirds.

This letter provides a basic listing of the species of concern for this site. For further conservation guidelines for these species, the Wildlife and Heritage Service would be glad to provide additional technical assistance. Please contact David Brinker at (410) 744-8939 or Scott A. Smith (410) 827-8612 for technical assistance.

Sincerely,



Lori A. Byrne  
Environmental Review Specialist  
Wildlife & Heritage Service

ER# 2001.1810.wo  
cc: S.A. Smith  
D. Brinker



## COMMONWEALTH of VIRGINIA

James S. Gilmore, III  
Governor

John Paul Woodley, Jr.  
Secretary of Natural Resources

Department of Game and Inland Fisheries

October 5, 2001

William L. Woodfin, Jr.  
Director

Shannon Cauley  
Senior Ecologist  
The Louis Berger Group, Inc.  
1819 H Street, Suite 900  
Washington, DC 20006

RE: ESSLOG #15507, PWC use at Assateague Island National Seashore

Dear Mr. Cauley:

This letter is in response to your request for information related to the presence of threatened or endangered species in the vicinity of the above referenced project.

The federally endangered/state endangered Delmarva Peninsula fox squirrel, (*Sciurus niger cinereus*), the federally threatened/state threatened loggerhead sea turtle, (*Caretta caretta caretta*), the federally threatened/state threatened bald eagle, (*Haliaeetus leucocephalus leucocephalus*) and the federally threatened/state threatened piping plover, (*Charadrius melodus melodus*) have been documented in the project area. The applicant should coordinate with this Department and the U.S. Fish and Wildlife Service to evaluate potential impacts to these species.

The state threatened peregrine falcon, (*Falco peregrinus*), and the state threatened gull-billed tern, (*Sterna nilotica aranea*) have been documented in the project area. The applicant should coordinate with this Department to evaluate potential impacts on these species.

This project area lies within the vicinity of documented waterbird colonies containing yellow-crowned night heron, (*Nyctanassa violacea violacea*), Caspian tern, (*Sterna caspia*), Forster's tern, (*Sterna forsterii*), least tern, (*Sterna antillarum*), herring gull, (*Larus argentatus*), black skimmer, (*Rynchops niger*), common tern, (*Sterna hirundo*), American oystercatcher, (*Haematopus palliatus*), great black-backed gull, (*Larus atricilla*), green heron, (*Butorides virescens*), cattle egret, (*Bubulcus ibis*), snowy egret, (*Egretta thula*), great egret, (*Ardea alba egretta*), little blue heron, (*Egretta caerulea caerulea*), tricolored heron, (*Egretta tricolor*), glossy ibis, (*Plegadis falcinellus*) and black-crowned night heron, (*Nycticorax nycticorax hoactii*). Therefore, the applicant should coordinate with this Department and the U.S. Fish and Wildlife Service to evaluate potential impacts to these colonies.

The federal species of concern northern diamond-backed terrapin, (*Malaclemys terrapin terrapin*) has been documented in the project area. The classification of "federal species of concern" is based on the following criteria: 4010 WEST BROAD STREET, P.O. BOX 11104, RICHMOND, VA 23230-1104  
(804) 367-1000 (V/TDD) Equal Opportunity Employment, Programs and Facilities FAX (804) 367-9147

Shannon Cauley  
ESSLog #15507  
10/5/2001  
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concern” is not a legal designation and does not require further coordination.

The state special concern species brown creeper, (*Certhia americana*), the state special concern species purple finch, (*Carpodacus purpureus*), the state special concern species golden-crowned kinglet, (*Regulus satrapa*), the state special concern species sandwich tern, (*Sterna sandvicensis acuflavidus*) and the state special concern species magnolia warbler, (*Dendroica magnolia*). The classification of “state special concern” is not a legal designation and does not require further coordination.

A block survey of an area encompassing the project site documented the following species during the breeding season: the state special concern species common moorhen, (*Gallinula chloropus cachinnans*). This species may occur at the project site if appropriate habitat exists, but no coordination is necessary at this time. The classification of “state special concern” is not a legal designation and does not require further coordination.

Information about fish and wildlife species was generated from our agency's computerized Fish and Wildlife Information System, which describes animals that are known or may occur in a particular geographic area. Field surveys may be necessary to determine the presence or absence of some of these species on or near the proposed area. Also, additional sensitive animal species may be present, but their presence has not been documented in our information system.

Endangered plants and insects are under the jurisdiction of the Virginia Department of Agriculture and Consumer Services, Bureau of Plant Protection. Questions concerning sensitive plant and insect species occurring at the project site should be directed to Keith Tignor at (804) 786-3515.

There is a processing charge of \$25.00 for our response. Please remit a check, made payable to <b>TREASURER OF VIRGINIA</b> , within 30 days to MaryBeth Murr at the address listed on the first page. Include a copy of this letter with your payment to ensure that your account is properly credited.
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This letter summarizes the likelihood of the occurrence of endangered or threatened animal species

at the project site. If you have additional questions in this regard, please contact me at (804) 367-2211. Please note that this response does not address any other environmental concerns; these issues are analyzed by our Environmental Services Section, in conjunction with interagency review of applications for state and federal permits. If you have any questions in this regard, please contact Tom Wilcox or Brian Moyer at (804) 367-6913.

The Fish and Wildlife Information Service, the system of databases used to provide the information in this letter, can now be accessed via the Internet! The Service currently provides

Shannon Cauley  
ESSLog #15507  
10/5/2001  
Page 2

access to current and comprehensive information about all of Virginia's fish and wildlife resources, including those listed as threatened, endangered, or special concern; colonial birds; waterfowl; trout streams; and all wildlife. Users can choose a geographic location and generate a report of species known or likely to occur around that point. From our main web page, at [www.dgif.state.va.us](http://www.dgif.state.va.us), choose the hyperlink to "Wildlife Information Online". For more information, please contact Amy Martin, Online Service Coordinator, at (804) 367-2211.

Thank you for your interest in the wildlife resources of Virginia.

Sincerely,



Amy Martin  
Online Service Coordinator

cc: R.T. Fernald, VDGIF  
K. Mayne, USFWS



J. Carlton Courter, III  
Commissioner

## COMMONWEALTH of VIRGINIA

Department of Agriculture and Consumer Services

Division of Consumer Protection

Office of Plant & Pest Services

PO Box 1163, Richmond, Virginia 23218

Phone: 804/786-3515 • Fax: 804/371-7793 • Hearing Impaired: 800/828-1120

[www.vdacs.state.va.us](http://www.vdacs.state.va.us)

October 22, 2001

Shannon R. Cauley  
The Louis Berger Group, Inc.  
1819 H Street, N.W.  
Suite 900  
Washington, DC 20006

RE: Assateague Island National Seashore

This letter is in response to your request regarding threatened or endangered plant or insects species in the vicinity of the Assateague Island National Seashore (AINS) in Accomack County, Virginia. The Northeastern Beach tiger beetle, federally listed as threatened, is in several locations within Accomack County. This protected insect is predominately found along the beaches of the Chesapeake Bay. It is not currently documented in the area of the AINS. The seabeach amaranth, *Amaranthus pumilus*, also occurs in the Accomack County area and has been documented near the AINS. This species, currently listed as threatened by the U.S. Fish and Wildlife Services (USFWS), is native to the barrier island beaches of the Atlantic Coast. An annual plant, this species requires extensive beach and inlet areas. The plant moves around in the landscape, occupying suitable habitat as it becomes available. It often grows in the same areas selected for nesting by shorebirds such as plovers, terns, and skimmers. Threats to this plant include beach stabilization efforts (particularly the use of beach armoring, such as sea walls and rip-rap), intensive recreational use, and herbivory by webworms.

In addition, the Virginia Department of Conservation and Recreation, Division of Natural Heritage (DCR/DNH), lists several sensitive communities along the Accomack County shoreline. These include tidal oligohaline marshes, maritime dune grasslands, maritime scrubs and maritime dune woodlands. Although the protection of these communities are of concern to DCR/DNH, there are currently no known Natural Area Preserves located in the vicinity of the AINS. You should contact DCR/DNH directly for more detailed information on the sensitive communities and Natural Area Preserves in Accomack County. Tom Smith is the division director for the Natural Heritage Program. He may be contacted by mail at:

-Equal Opportunity Employer-



Department of Conservation and Recreation  
Division of Natural Heritage  
217 Governor St.  
Richmond, VA 23219

I appreciate the opportunity to comment on the environmental impact of personal watercraft usage at the AINS. There are currently no plant or insect species within this seashore area protected by Virginia laws or regulations. The USFWS and DCR/DNH should be contacted for further information regarding federally protected plants and insects and sensitive natural resources, respectively.

Sincerely,

A handwritten signature in black ink, appearing to read 'Keith R. Tignor', with a stylized flourish at the end.

Keith R. Tignor  
Endangered Species Coordinator

# APPENDIX C: APPROACH TO EVALUATING SURFACE WATER QUALITY IMPACTS

## Objective

Using simplifying assumptions, estimate the minimum (threshold) volume of water in a reservoir or lake below which concentrations of gasoline constituents from personal watercraft (PWC) or outboards would be potentially toxic to aquatic organisms or humans. Using the estimated threshold volumes, and applying knowledge about the characteristics of the receiving water body and the chemical in question, estimate if any areas within the water body of interest may present unacceptable risks to human health or the environment.

## Overall Approach

Following are the basic steps in evaluating the degree of impact a water body (or portion of a water body) would experience based on an exceedance of water quality standards/ toxicity benchmarks for PWC-and outboard-related contaminants.

1. Determine concentrations of polycyclic aromatic hydrocarbons (PAHs), benzene, and methyl tertiary-butyl ether (MTBE) in gasoline (convert from weight percent to mg/L, as needed) and PAHs in exhaust. The half-life of benzene in water is 5 hours at 25° C (Verschuren 1983; US EPA 2001).
2. Estimate loading of PAHs, benzene, and MTBE for various appropriate PWC-hour levels of use for one day (mg/day)
3. Find/estimate ecological and human health toxicity benchmarks (risk-based concentrations [RBCs]) (µg/L) for PAHs, benzene, and MTBE.
4. Divide the estimated loading for each constituent (µg) by a toxicity benchmark (µg/L) to determine the water body threshold volume (L) below which toxic effects may occur (convert liters to acre-feet).

Estimated reductions in hydrocarbon (HC) emissions from personal watercraft and outboards would be significantly reduced in the near future, based on regulations issued by the Environmental Protection Agency and the California Air Resources Board (see the estimated reductions in Table 18, page 94).

## Assumptions and Constants

Several assumptions must be made in order to estimate water body threshold volumes for each HC evaluated. Each park should have park-specific information that can be used to modify these assumptions or to qualitatively assess impacts in light of park-specific conditions of mixing, stratification, etc. and the characteristics of the chemicals themselves. The assumptions are as follows:

- BTEX (benzene, toluene, ethyl benzene, and xylene) are volatile and do not stay in the water column for long periods of time. Because benzene is a recognized human carcinogen, it is retained for the example calculations below and should be considered in each EA or EIS (Verschuren 1983; US EPA 2001).

- MTBE volatilizes slightly and is soluble in water. MTBE may accumulate in water from day to day, but this is not factored into the calculation and should be considered qualitatively in the assessment.
- PAHs volatilize slightly (depending on structure and molecule size) and may adhere to sediment and settle out of the water column or float to the surface and be photo-oxidized. They may accumulate in water from day to day, but this is not factored into the calculation and should be considered qualitatively in the assessment.
- The toxicity of several PAHs increases (by several orders of magnitude) when the PAHs are exposed to sunlight. This was not incorporated because site-specific water transparency is not known, and should be discussed qualitatively.
- The threshold volume of water will mix vertically and aurally with contiguous waters to some extent, but the amount of this mixing will vary from park to park and location to location in the lake, reservoir, river, etc. Therefore, although the threshold volume calculation assumes no mixing, this should be discussed in the assessment after the threshold volume is calculated. The presence or absence of a thermocline should also be addressed.
- Volume of the water body, or portion thereof, is estimated by the area multiplied times the average depth.

In addition to these assumptions, several constants required to make the calculations were compiled from literature and agency announcements. Gasoline concentrations are provided for benzene, MTBE and those PAHs for which concentrations were available in the literature. Constants used are:

- Gasoline emission rate for two-stroke personal watercraft: 3 gal/hour at full throttle (California Air Resources Board 1998)
- Gasoline emission rate for two-stroke outboards: estimated at approximately the same as for personal watercraft for same or higher horsepower outboards (80-150 hp); approximately twice that of personal watercraft for small (e.g. 15 hp) outboards. (Note: Assume total hours of use for the various size boats/motors, and that smaller 15 hp motors that exhaust relatively more unburned fuel would probably be in use for a much smaller amount of time than the recreational speedboats and PWC). This estimate is based on data from Allen et al. 1998 (Fig. 5). It is noted that other studies may show different results, e.g. about the same emissions regardless of horsepower, or larger horsepower engines having more emissions than smaller engines (e.g., California Air Resources Board 2001); the approach selected represents only one reasonable estimate.
- 1 gallon = 3.78 liters
- Specific gravity of gasoline: 739 g/L
- 1 acre-foot =  $1.234 \times 10^6$  L
- Concentration of benzo(a)pyrene (B[a]P) in gasoline: 2.8 mg/kg (or 2.07 mg/L) (Gustafson et al., 1997)
- Concentration of naphthalene in gasoline: 0.5% or 0.5 g/100 g (or 3695 mg/L) (Gustafson et al., 1997)
- Concentration of 1-methyl naphthalene in gasoline: 0.78% or 0.78 g/100 g (or approx. 5760 mg/L) (estimated from Gustafson et al., 1997)

- Concentration of benzene in gasoline: 2.5% or 2.5 g/100 g (or  $1.85 \times 10^4$  mg/L) (Hamilton 1996)
- Concentration of MTBE in gasoline: 15% or 15 g/100 g (or approx.  $1.10 \times 10^5$  mg/L) (Hamilton 1996). (Note: MTBE concentrations in gasoline vary from state to state. Many states do not add MTBE.)
- Estimated emission of B(a)P in exhaust: 1080 µg/hr (from White and Carroll, 1998, using weighted average B(a)P emissions from 2 cylinder, carbureted 2-stroke liquid cooled snow mobile engine using gasoline and oil injected Arctic Extreme injection oil, 24-38:1 fuel:oil ratio. Weighted average based on percentage of time engine was in five modes of operation, from full throttle to idle).
- Estimated amount of B(a)P exhaust emissions retained in water phase = approximately 40% (based on value for B(a)P from Hare and Springier, quoted in North American Lake Management Society 2001)

### Toxicity Benchmarks

A key part of the estimations is the water quality criterion, standard, or toxicological benchmark for each contaminant evaluated. There are no EPA water quality criteria for the protection of aquatic life for the PWC-related contaminants (US EPA, 1999). There are, however, a limited number of EPA criteria for the protection of human health (via ingestion of water and aquatic organisms). Chronic ecotoxicological and human health benchmarks for contaminants were acquired from various sources. Following are the toxicity benchmarks for the PAHs, benzene, and MTBE having gasoline concentration information:

Chemical	Ecological Benchmark (µg/L)	Source	Human Health Benchmark** (µg/L)	Source
Benzo(a)pyrene	0.014	Suter and Tsao 1996	0.0044	US EPA 1999a**
Naphthalene	62	Suter and Tsao 1996	--	--
1-methyl naphthalene	19–34*	USFWS 2000	--	--
Benzene	130	Suter and Tsao 1996	1.2	US EPA 1999a**
MTBE	57,000***	Wong et al. 2001	--****	--

\* Based on LC<sub>50</sub>s of 1900 and 3400 µg/L for dungeness crab and sheepshead minnow, respectively (34 µg/L used for freshwater calculations)

\*\* Based on the consumption of water and fish.

\*\*\*A draft water quality criteria document for MTBE for the protection of aquatic life is expected to be issued in early 2002. These criteria will be based, in part, on work performed by Mancini et al. 2002. A notice of intent was published in the *Federal Register* in October 1999 (64 FR 58409). Preliminary marine ecological criteria are 53,000 µg/L (acute) and 18,000 µg/L (chronic) (Mancini et al. 2002).

\*\*\*\* Toxicological information for MTBE is currently under review. There is no EPA human health benchmark, but CA has established a public health goal of 13 µg/L, which is used in calculations below.

### Example Calculations

Calculations of an example set of water body volume thresholds are provided below for the chemicals listed above together with their concentrations in gasoline and available toxicity benchmarks.

#### Loading to Water

The contaminant loading to water was calculated for one day assuming a given number of watercraft operating for a given number of hours, each discharging 11.34 L gasoline per hour and having concentrations in fuel or exhaust as listed.

*Benzo(a)pyrene (from the fuel):*  $40 \text{ PWC-hrs} \times 11.34 \text{ L gas/hr} \times 2.07 \text{ mg/L} = 939 \text{ mg}$

*Benzo(a)pyrene (from the gas exhaust):*  $40 \text{ PWC-hrs} \times 1080 \text{ } \mu\text{g/hr} \times 1/1000 \text{ mg/} \mu\text{g} \times 0.40 = 17 \text{ mg}$

*Total B(a)P* = 956 mg

*Naphthalene:*  $40 \text{ PWC-hrs} \times 11.34 \text{ L gas/hr} \times 3695 \text{ mg/L} = 1.68 \times 10^6 \text{ mg}$

*1-methyl naphthalene:*  $40 \text{ PWC-hrs} \times 11.34 \text{ L gas/hr} \times 5760 \text{ mg/L} = 2.61 \times 10^6 \text{ mg}$

*Benzene:*  $40 \text{ PWC-hrs} \times 11.34 \text{ L gas/hr} \times 1.85 \times 10^4 \text{ mg/L} = 8.39 \times 10^6 \text{ mg}$

*MTBE:*  $40 \text{ PWC-hrs} \times 11.34 \text{ L gas/hr} \times 1.10 \times 10^5 \text{ mg/L} = 4.99 \times 10^7 \text{ mg}$

Loadings of contaminants from two-stroke outboards were estimated based on the estimated loading based on the horsepower of the outboards involved (see “Assumptions and Constants” above) and the estimated hours of use, based on the types of boats and the pattern of use observed.

### Threshold Volumes

Threshold volumes of water (volume at which a PWC- or outboard-related contaminant would equal the thresholds listed above) are calculated by dividing the estimated loadings (mg of contaminant) for the number of operational hours (e.g., 40 PWC-hours) by the listed toxicity benchmark concentrations ( $\mu\text{g/L}$ ) and correcting for units ( $1 \text{ mg} = 10^3 \text{ } \mu\text{g}$ ):

### Protection of Aquatic Organisms

*Benzo(a)pyrene:*  $956 \text{ mg B(a)P} \times 10^3 \text{ } \mu\text{g/mg} / 0.014 \text{ } \mu\text{g/L} = 6.8 \times 10^7 \text{ L or } 55 \text{ acre-ft}$

*Naphthalene:*  $1.68 \times 10^6 \text{ mg naphthalene} \times 10^3 \text{ } \mu\text{g/mg} / 62 \text{ } \mu\text{g/L} = 2.71 \times 10^7 \text{ L or } 22 \text{ acre-ft}$

*1-methyl naphthalene:*  $2.53 \times 10^6 \text{ mg 1-methyl naphthalene} \times 10^3 \text{ } \mu\text{g/mg} / 34 \text{ } \mu\text{g/L} = 7.44 \times 10^7 \text{ L or } 60 \text{ acre-ft}$

*Benzene:*  $8.39 \times 10^6 \text{ mg benzene} \times 10^3 \text{ } \mu\text{g/mg} / 130 \text{ } \mu\text{g/L} = 6.46 \times 10^7 \text{ L or } 52 \text{ acre-ft}$

*MTBE:*  $4.99 \times 10^7 \text{ mg MTBE} \times 10^3 \text{ } \mu\text{g/mg} / 57000 \text{ } \mu\text{g/L} = 8.75 \times 10^5 \text{ L or } 0.71 \text{ acre-ft}$

Based on these estimates and assumptions, 1-methyl naphthalene appears to be the contaminant (of those analyzed) that would be the first to accumulate to concentrations potentially toxic to aquatic organisms (i.e., it requires more water [60 acre-ft] to dilute the contaminant loading to a concentration below the toxicity benchmark); however, the threshold volumes are very similar between 1-methyl naphthalene, benzo(a) pyrene, and benzene.

### Protection of Human Health

*Benzo(a)pyrene:*  $956 \text{ mg B(a)P} \times 10^3 \text{ } \mu\text{g/mg} / 0.0044 \text{ } \mu\text{g/L} = 2.17 \times 10^8 \text{ L or } 176 \text{ acre-ft}$

*Benzene:*  $8.39 \times 10^6 \text{ mg benzene} \times 10^3 \text{ } \mu\text{g/mg} / 1.2 \text{ } \mu\text{g/L} = 6.99 \times 10^9 \text{ L or } 5,670 \text{ acre-ft}$

Note; If CA public health goal of  $13 \text{ } \mu\text{g/L}$  used: *MTBE:*  $4.99 \times 10^7 \text{ mg MTBE} \times 10^3 \text{ } \mu\text{g/mg} / 13 \text{ } \mu\text{g/L} = 1.66 \times 10^9 \text{ L or } 3110 \text{ acre-ft}$

The California public health goal for MTBE is a drinking water based goal and is not directly comparable to the other criteria used in this analysis. However, it may be of interest, since MTBE does not volatilize rapidly and is very soluble, and MTBE concentration could be an issue if the receiving body of water was used for drinking water purposes (unlikely given the estuarine/marine waters at the national seashore) and MTBE was not treated. Using the numbers provided above, benzene would be the first PWC-related contaminant in these example calculations that would reach unacceptable levels in surface water; however, volatilization of benzene from water to air was not included in the calculation. MTBE would be the next contaminant to reach unacceptable concentrations.

As a result of the estimated reductions in HC emissions (from the unburned fuel) in response to EPA regulations (listed above), additional personal watercraft and/or outboards may be used in the parks without additional impacts to water quality. For example, based on the expected overall reductions from EPA (1996), up to 75% additional personal watercraft/outboards may be used in a given area in 2025 without additional impacts to water quality over current levels. Effects on noise levels, physical disturbance, or hydrocarbon emissions that are products of combustion (e.g., B(a)P) may not be similarly ameliorated by the reduced emission regulations.

### **Application of Approach**

Use of the approach described above for evaluating possible exceedance of standards or other benchmarks must be adapted to the unique scenarios presented by each park, PWC use, and water body being evaluated. State water quality standards (including the numeric standards and descriptive text) must be reviewed and applied, as appropriate.

Factors that would affect the concentration of the contaminants in water must be discussed in light of the park-specific conditions. These factors include varying formulations of gasoline (especially for MTBE); dilution due to mixing (e.g., influence of the thermocline), wind, currents, and flushing; plus loss of the chemical due to volatilization to the atmosphere (Henry's Law constants can help to predict volatilization to air; see Yaws et al. 1993); adsorption to sediments and organic particles in the water column (e.g., PAHs), oxidation, and biodegradation (breakdown by bacteria). Toxicity of phototoxic PAHs may be of concern in more clear waters, but not in very turbid waters.

The chemical composition of gasoline will vary by source of crude oil, refinery, and distillation batch. No two gasolines will have the exact same chemical composition. For example, B(a)P concentrations may range from 0.19 to 2.8 mg/kg, and benzene concentrations may range from 0 to 7% (2-3% is typical). MTBE concentrations will vary from state to state and season to season, with concentrations ranging from 0-15%. The composition of gasoline exhaust is dependent on the chemical composition of the gasoline and engine operating conditions (i.e., temperature, rpms, and oxygen intake). If site-specific information is available on gasoline and exhaust constituents, they should be considered in the site-specific evaluation. If additional information on the toxicity of gasoline constituents (e.g., MTBE) becomes available, they should be considered in the site-specific evaluation.

Lastly, results of the studies included in the collection of papers entitled "Personal watercraft Research notebook" provided by the NPS staff, can be used to provide some framework for your analysis. A table summarizing some of the results presented in various documents on the collection for benzene, benzo(a)pyrene, and MTBE is attached.

**Table C-1: Pollutant Concentrations Reported in Water**

Pollutant	Source(s)	Levels Found:	
		"Lower Use" (e.g. open water, offshore locations; reduced motorized watercraft use)	"Higher Use" (e.g., nearshore, motorized watercraft activity high)
Benzene	<i>Lake Tahoe Motorized Watercraft Report</i> ; several studies reported USGS Miller and Fiore U of CA	1. <0.032 µg/l 2. <=0.3 µg/l 3. <0.1 µg/l	1. 0.13 – 0.33 µg/l 2. just over 1 µg/l 3. 0.1 – 0.9 µg/l
PAHs	A. Mastran et al.  B. Oris et al.	A. All below detection limits (<0.1 µg/l for pyrene and naphthalene; <2.5 µg/l for B(a)P, B(a)A, chrysene) B. Experiment #1 – 2.8 ng/l phototoxic PAHs	A. Total PAHs – up to 4.12 µg/l in water column; total PAHs - up to 18.86 µg/l in surface sample at marina, with naphthalene at 1µg/l; B(a)P – >=2.3µg/l B. Experiment #1 – approx. 45 ng/l phototoxic PAHs; 5-70 ng/L total PAHs
MTBE	A. <i>Lake Tahoe Motorized Watercraft Report</i> ; several studies reported 1. USGS 2. Miller and Fiore 3. U of CA  4. U of Nevada – Fallen Leaf Lake 5. Donner Lake (Reuter et al. 1998) B. VanMouwerik and Hagemann 1999 6. Lake Perris 7. Shasta Lake 8. 3-day jet ski event 9. Lake Tahoe	1. 0.11 – 0.51 µg/l 2. <=3 µg/l 3. less than nearshore area 4. -- 5. <0.1µg/l  6. 8 µg/l (winter)	1. 0.3 – 4.2 µg/l 2. 20 µg/l (up to approx. 31) 3. up to 3.77 µg/l  4. 0.7 – 1.5 µg/l 5. up to 12 µg/l Dramatic increase from 2 – to 12 µg/l over period from July 4 to 7)  6. up to 25 µg/l 7. 9-88 µg/l over Labor Day weekend 8. 50-60 µg/l 9. often within range of 20-25 µg/l, with max of 47 µg/l

# GLOSSARY

**national ambient air quality standards (NAAQS)** — Concentrations of criteria pollutants in ambient air (outdoor air to which the public may be exposed) below which it is safe for humans or other receptors to be permanently exposed. The Clean Air Act establishes two types of national air quality standards. **Primary standards** set limits to protect public health, including the health of “sensitive” populations such as asthmatics, children, and the elderly. **Secondary standards** set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

The EPA Office of Air Quality Planning and Standards has set national ambient air quality standards for six principal pollutants, which are called “criteria” pollutants. They are listed below. Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter of air ( $\text{mg}/\text{m}^3$ ), and micrograms per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ).

**National Ambient Air Quality Standards**

Pollutant	Standard Value*		Standard Type
Carbon Monoxide (CO)			
8-hour Average	9 ppm	(10 mg/m <sup>3</sup> )	Primary
1-hour Average	35 ppm	(40 mg/m <sup>3</sup> )	Primary
Nitrogen Dioxide (NO <sub>2</sub> )			
Annual Arithmetic Mean	0.053 ppm	(100 µg/m <sup>3</sup> )	Primary & Secondary
Ozone (O <sub>3</sub> )			
1-hour Average	0.12 ppm	(235 µg/m <sup>3</sup> )	Primary & Secondary
8-hour Average **	0.08 ppm	(157 µg/m <sup>3</sup> )	Primary & Secondary
Lead (Pb)			
Quarterly Average	1.5 µg/m <sup>3</sup>		Primary & Secondary
Particulate (PM 10) <i>Particles with diameters of 10 micrometers or less</i>			
Annual Arithmetic Mean	50 µg/m <sup>3</sup>		Primary & Secondary
24-hour Average	150 µg/m <sup>3</sup>		Primary & Secondary
Particulate (PM 2.5) <i>Particles with diameters of 2.5 micrometers or less</i>			
Annual Arithmetic Mean **	15 µg/m <sup>3</sup>		Primary & Secondary
24-hour Average **	65 µg/m <sup>3</sup>		Primary & Secondary
Sulfur Dioxide (SO <sub>2</sub> )			
Annual Arithmetic Mean	0.03 ppm	(80 µg/m <sup>3</sup> )	Primary
24-hour Average	0.14 ppm	(365 µg/m <sup>3</sup> )	Primary
3-hour Average	0.50 ppm	(1300 µa/m <sup>3</sup> )	Secondary

\* Parenthetical value is an approximately equivalent concentration.

\*\* The ozone 8-hour standard and the PM 2.5 standards are included for information only. A 1999 federal court ruling blocked implementation of these standards, which EPA proposed in 1997. EPA has asked the U.S. Supreme Court to reconsider that decision.

**NONROAD Model** — An air quality emissions estimation model developed by the U.S. Environmental Protection Agency to estimate emissions from various spark-ignition type “nonroad” engines. The June 2000 draft of the NONROAD model was used to estimate air pollutant emissions from personal watercraft. It is available at <<http://www.epa.gov/otaq/nonrdmdl.html>>.

**personal watercraft (PWC)** — As defined in 36 CFR §1.4(a) (2000), refers to a vessel, usually less than 16 feet in length, which uses an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. The vessel is intended to be operated by a person or persons sitting, standing, or kneeling on the vessel, rather than within the confines of the hull. The length is measured from end to end over the deck excluding sheer, meaning a straight line measurement of the overall length from the foremost part of the vessel to the aftermost part of the vessel, measured parallel



to the centerline. Bow sprits, bumpkins, rudders, outboard motor brackets, and similar fittings or attachments, are not included in the measurement. Length is stated in feet and inches.

**SUM06** — The accumulation of instances when measured hourly average ozone concentrations equal or exceed 0.06 part per million (ppm) in a stated time period, expressed in ppm-hours

## REFERENCES CITED

ASA	Acoustical Society of America
ATSDR	Agency for Toxic Substances and Disease Registry
AWA	American Watercraft Association
CFR	Code of Federal Regulations
CPFPWS	Coalition of Parents and Families for Personal Watercraft Safety
EPA	U.S. Environmental Protection Agency
FFWCC	Florida Fish and Wildlife Conservation Commission
IWL	Izaak Walton League of America
MDNR	Maryland Department of Natural Resources
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NSBC	National Safe Boating Council
NTSB	National Transportation Safety Board
ODEQ	Oregon Department of Environmental Quality
PWIA	Personal Watercraft Industry Association
TNC	The Nature Conservancy
TRPA	Tahoe Regional Planning Agency
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VADCR	Virginia Department of Conservation and Recreation
VADGIF	Virginia Department of Game and Inland Fisheries
VDEQ	Virginia Department of Environmental Quality
VIMS	Virginia Institute of Marine Science

### Acoustical Society of America

- 2000 "A Software Model to Estimate Zones of Impact on Marine Mammals Around Anthropogenic Noise." By Christine Erbe and D. M. Farmer. Available at <<http://pulson.seos.uvic.ca/people/erbe/JASA2000b.pdf>>. Web site visited Aug. 23, 2001.

### Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services

- 1996 "Toxicological Profile for Methyl *tert*-Butyl Ether." Atlanta: Public Health Service. Available on the Internet at <<http://www.atsdr.cdc.gov/toxprofiles/tp91.pdf>>.
- 1997 "Toxicological Profile for Benzene." Atlanta: Public Health Service. Available on the Internet at <<http://www.atsdr.cdc.gov/toxprofiles/>>.
- 2001 "ToxFAQ's for Polycyclic Aromatic Hydrocarbons (PAHs)." Available at <<http://www.atsdr.cdc.gov/tfacts69.html>>. Web site visited Sept. 5, 2001.

### Albers, Peter H.

- 2000 "Sources, Fate, and Effects of PAHs in Shallow Water Environments." In *Impacts of Motorized Boats on Shallow Water Systems*, Science Workshop Abstracts, November 7–8, 2000, Douglass College Center, Rutgers, the State University of New Jersey. Rutgers, NJ.

### Allen, B. C., J. E. Reuther, C. R. Goldman, M. F. Fiore, and G. C. Miller

- 1998 "Lake Tahoe Motorized Watercraft Report — An Integration of Water Quality, Watercraft Use and Ecotoxicology Issues." Preliminary draft report prepared for the Tahoe Regional Planning Agency.

### American Watercraft Association

- 2001 "The Advocate Action Kit: Personal Watercraft and the Environment." Burbank, CA.

- Anderson, Franz E.  
2000 "Effect of Wave-wash from Personal Watercraft on Salt Marshes." In *Impacts of Motorized Boats on Shallow Water Systems*, Science Workshop Abstracts, November 7–8, 2000, Douglass College Center, Rutgers, the State University of New Jersey. Rutgers, NJ.
- Asplund, Tim  
2001 "The Effects of Motorized Watercraft on Aquatic Ecosystems." Draft paper. Wisconsin Department of Natural Resources and University of Wisconsin, Madison.
- Assateague Naturalist, The  
2000 "The Assateague Naturalist." Available at <<http://www.assateague.com>>. Web site visited Nov. 7, 2001.
- At the Beach  
1999 "Shellfish Information for Assateague Island." Available at <<http://atbeach.com/mdstpark/shell.html>>. Web site visited Nov. 7, 2001.
- Bashore, T., and National Park Service, U.S. Department of the Interior  
n.d. "A Checklist to the Mammals of Assateague Island." Prepared by Dr. Terry Basher, University of Maryland Eastern Shore and the naturalist staff of Assateague Island National Seashore. On file at Assateague Island National Seashore, Berlin, MD.
- Bearss, Edwin C.  
1968 *General Background Study and Historical Base Map, Assateague Island National Seashore*. U.S. Department of the Interior, National Park Service. Washington, DC.
- Bluewater Network  
2001 "Jet Skis Position Paper." Available at <<http://www.earthisland.org/bw/jetskipos.html>>.
- Bohlen, Chris, and Walter Boynton  
n.d. *Status and Trends of Eutrophication, Chemical Contamination, Habitat Loss/Modification, Pathogens and Living Resources in the Maryland Coastal Bays*. University of Maryland System, Chesapeake Biological Laboratory, Solomons, MD.
- Boynton, W. R. L., Murray, J. D. Hagy, C. Stokes, and W. M. Kemp  
1996 "A Comparative Analysis of Eutrophication Patterns in a Temperate Coastal Lagoon." *Estuaries* 19(2B): 408–21. Quoted in Chris Bohlen, *Status and Trends of Eutrophication, Chemical Contamination, Habitat Loss/Modification and Living Resources in the Maryland Coastal Bays*, University of Maryland System, Chesapeake Biological Laboratory. n.d., Salomonis, MD.
- Branche, C. M., J. M. Conn, J. L. Annest  
1997 "Personal Watercraft-Related Injuries: A Growing Public Health Concern." *Journal of the American Medical Association* 278(8): 663–65.
- Burger, J.  
1998 "Effects of Motorboats and Personal Watercraft on Flight Behavior over a Colony of Common Terns." *The Condor* 100: 528–34.
- Burger, J. and J. Leonard  
1999 "Conflict Resolution in Coastal Waters: the Case of Personal Watercraft." *Marine Policy* 24: 61–67.
- California Air Resources Board  
1998 "Proposed Regulations for Gasoline Spark-Ignition Marine Engines, Draft Proposal Summary." Mobile Source Control Division, California Air Resources Board.  
1999 "Fact Sheet – New Regulations for Gasoline Engines." California Air Resources Board. Available at <[www.arb.ca.gov/msprog/marine/marine.html](http://www.arb.ca.gov/msprog/marine/marine.html)>.
- Coalition of Parents and Families for Personal Watercraft Safety  
2000 "Statistics." Available at <<http://www.pwcwatch.org/statistics.html>>.

## REFERENCES CITED

---

### Coastal Caroline University

- 1998 "Underwater Noise Pollution and Marin Mammals." By Beth Brost, Bernard Johnson, and Diane Tulipani. Available at <<http://kihgfish.coastal.edu/mairne/375/noise.html>>. Web site visited Aug. 27, 2001.

### Continental Shelf Associates for Personal Watercraft Industry Association

- 1997 "Effects of Personal Watercraft Operation on Shallow-water Seagrass Communities in the Florida Keys." Jupiter, FL.

### Cornell University

- n.d. "Effects of Human-made Sound on the Behavior of Whales." Bioacoustics Research Program, Cornell Lab of Ornithology. Available at <<http://birds.cornell.edu/BRP/ResWhale.html>>. Web site visited Nov. 7, 2001.

### Earth Share of California

- n.d. "The Hazards of Personal Watercraft." *Making Waves* 15, no.3. Available at <<http://www.earthshareca.org/about/features/skidoos.html>>.

### Florida Fish and Wildlife Conservation Commission

- 2000 "Buffer Zone Distances to Protect Foraging and Loafing Waterbirds from Disturbance by Personal Watercraft in Florida (Study 7520)." Prepared by J. Rodgers Jr. Bureau of Wildlife Diversity Conservation. Gainesville, FL.

### Gustafson, J. B., J. G. Tell, and D. Orem

- 1997 "Selection of Representative TPH Fractions Based on Fate and Transport Considerations." Final draft. Vol. 3. TPH Criteria Working Group, Fate and Transport Technical Action Group. Amherst Scientific Publishing.

### Hamilton, Bruce

- 1996 "FAQ: Automotive Gasoline." 4 parts. Available at <[www.faqs.org/faqs/autos/gasoline-faq](http://www.faqs.org/faqs/autos/gasoline-faq)>.

### Hare, C. T., and K. J. Springier

- 1973 "Exhaust Emissions from Uncontrolled Vehicles and Related Equipment Using Internal Combustion Engines." Final Report. Part Two: "Outboard Motors." Prepared for the U.S. Environmental Protection Agency by Southwest Research Institute, San Antonio, TX. Available at <<http://www.nalms.org/bclss/impactsoutboard.html>>.

### Hastings M.C., A. N. Popper, J. J. Finneran, P. J. Lanford

- 1996 "Effects of Low-Frequency Underwater Sound on Hair Cells of the Inner Ear and Lateral Line of the Teleost Fish *Astronotus ocellatus*." *Journal of the Acoustics Society of America* 99 (3):1759–66. Department of Mechanical Engineering, Ohio State University, Columbus.

### Hill, S.R.

- 1984 "A Botanical Survey of the Maryland Portion of Assateague Island." *Vegetative Mapping: The Rare or Threatened Vascular Plant Species; Status and Locations*.

### Institute for Public Affairs and Civic Engagement at Salisbury University (PACE)

- 2001 "The Maryland Coastal Bays: A Survey of Community Attitudes." Prepared for the Maryland Coastal Bays Program, Annapolis, MD.

### Izaak Walton League of America

- 1999 "Caught in the Wake. The Environmental and Human Health Impacts of Personal Watercraft," by Laurie C. Martin. Available at <<http://www.iwla.org>>.

### Knecht, Richard A., and M. E. Colleen Lazenby

- 1985 "Survey and Archeological Mapping of Four Historic Sites: North Beach Life Saving Station, Seaboard Fish Oil and Guano Company, Scott's Ocean House Hotel, and Green Run Inlet Cemetery." U.S. Department of the Interior, National Park Service. Washington, DC.

- Law Engineering and Environmental Sciences, Inc., Arcadis JSA, and RTI  
2002 "Economic Analysis of Personal Watercraft Regulations in Assateague Island National Seashore." Prepared for the National Park Service.
- Lea, C.  
1998 "Vegetation Classification of Assateague Island National Seashore, Addendum 2." On file at Assateague Island National Seashore, Berlin, MD.  
2000a "Assateague Island National Seashore, Vegetation Monitoring, North End Restoration, Update, 1996–2000." On file at Assateague Island National Seashore, Berlin, Md.
- Lea C., H. Hamilton, F. Hudson, and N. Roeder  
2000. "Assateague Island National Seashore – Additions to Flora and Rare Plant Surveys and Status, 1996–1999." Division of Resource Management, Assateague Island National Seashore, Berlin, MD.
- Lea, C., and S. King  
2001 "Assateague Island National Seashore Seabeach Amaranth Restoration Progress Report." On file at Assateague Island National Seashore. Berlin, MD.
- Mabey, Sarah E., James McCann, Lawrence J. Niles, Charles Bartlett, and Paul Kerlinger  
1993 The Neotropical Songbird Coastal Corridor Study. Maryland and Virginia.
- Mace, B. E., R. D. Nine, N. N. Clark, T. J. Vanyo, V. T. Remcho, and R. W. Morrison  
1998 "Emissions from Marine Engines with Water Contact in the Exhaust Stream." SAE Technical Paper Series. Warrendale, PA.
- Mancini, E. R., A. Steen, G. A. Rausina, D. C. L. Wong, W. R. Arnold, F. E. Gostomski, T. Davies, J. R. Hockett, W. A. Stubblefield, K. R. Drott, T. A. Spring, and P. Errico  
2002 "MTBE Ambient Water Quality Criteria Development: A Public/Private Partnership." *Environmental Science and Technology* 36: 125–29.
- Maryland Department of Natural Resources (MDNR)  
1999 *Maryland Coastal Bays Watershed Conservation and Management Plan Summary*. Coastal Bays Program. Annapolis, MD.  
2001 "Maryland Boat Registration and Numbering Requirements." Available at <[www.dnr.state.md.us/boating/regulations/randn.html](http://www.dnr.state.md.us/boating/regulations/randn.html)>. Web site visited Aug. 27, 2001.  
2001a "Boat Operating Procedures in Maryland." Available at <[www.dnr.state.md.us/boating/regulations/op.html](http://www.dnr.state.md.us/boating/regulations/op.html)>. Web site visited Aug. 27, 2001.  
2001b "Boating Safety Education Requirements." Available at <[www.dnr.state.md.us/boating/regulations/bser.html](http://www.dnr.state.md.us/boating/regulations/bser.html)>. Web site visited Aug. 27, 2001.  
2001b "Law Enforcement — Natural Resources Police." Available at <[www.dnr.state.md.us/boating/regulations/le.html](http://www.dnr.state.md.us/boating/regulations/le.html)>. Web site visited Aug. 27, 2001.
- Mestre Greve Associates  
1992 *Noise Assessment for Beaver Basin Rim Road. Pictured Rocks National Lakeshore*. Prepared for the National Park Service. Newport Beach, CA.
- Miller, Glenn C., and Mary Fiore  
1997 "Preliminary Study on Gasoline Constituents in Lake Tahoe." University of Nevada, Reno. Quoted in Oregon Department of Environmental Quality, "Carbureted 2-Stroke Marine Engines, Impacts on the Environment and Voluntary Policy options to Encourage Their Replacement."
- Mitchell Joseph C., John M. Anderson, and Terry D. Schwaner  
1993 *The Amphibians and Reptiles of Assateague Island National Seashore, Final Report*. Virginia Museum of Natural History, Martinsville, VA.
- National Academy of Sciences  
1972 *Particulate Polycyclic Organic Matter*. Washington, DC.

## REFERENCES CITED

---

- National Oceanic and Atmospheric Administration, U.S. Department of Commerce  
2000 NOAA Navigational Chart #12211. Washington, DC.
- National Park Service, U. S. Department of the Interior  
1982 *Assateague Island National Seashore, General Management Plan*. Denver Service Center.  
1991 *Assateague Island National Seashore Water Quality Monitoring 1987-1990 Data Summary and Report*. Water Resources Division, Fort Collins, Colorado and Assateague Island National Seashore, Berlin, Maryland.  
1992 "Air Resource Management." Available at <[http://www.National Park Service.gov/planning/mngmtplc/nrmarm.html](http://www.NationalParkService.gov/planning/mngmtplc/nrmarm.html)> Web site visited August 22, 2001.  
1995 "Use of Personal Watercraft in Glacier National Park." Unpublished paper on file at Glacier National Park headquarters.  
1998a "Personal Watercraft Observations by National Park Service Staff," Jack Kumer. On file at Assateague Island National Seashore, Berlin, MD.  
1998b "Proposed Rule on Personal Watercraft Use within the National Park Service System." Available at <<http://www.nps.gov/refdesk/1pwcrule.html>>.  
1999a "Assateague Island National Seashore Loggerhead Sea Turtle Nests, 1999." On file at Assateague Island National Seashore, Berlin, MD.  
1999b "Water Quality Concerns Related to Personal Watercraft Usage," by M. VanMouwerik and M. Hagemann. Technical paper. Water Resources Division, Fort Collins, CO.  
2000a "Assateague Island National Seashore 2000 Visitor Survey Card Data Report." On file at Assateague Island National Seashore, Berlin, MD.  
2000b "Determination of the Appropriateness of Personal Watercraft Use within Assateague Island National Seashore." On file at Assateague Island National Seashore, Berlin, MD.  
2000c *Management and Monitoring of the Piping Plover (Charadrius melodus) at Assateague Island National Seashore*. On file at Assateague Island National Seashore, Berlin, MD.  
2000d *Management Policies 2001*. Washington, DC. Available at <<http://www.nps.gov>>.  
2000e *Strategic Plan for Assateague Island National Seashore (October 1, 2000 – September 30, 2005)*. On file at Assateague Island National Seashore, Berlin, MD.  
2001a "Assateague Island National Seashore." Available at <<http://www.nps.gov/asis>>. Web site visited August 28, 2001.  
2001b Assateague Island National Seashore Monthly Public Use Reports. 1996–7/2001. Assateague Island National Seashore, Berlin, MD.  
2001c "Personal Watercraft (PWC) Observations by Resource Management Staff." On file at Assateague Island National Seashore, Berlin, MD.  
2001d "PWC Statistics for June 30th, July 1st, and July 4th." Data Sheet. On file at Assateague Island National Seashore, Berlin, MD.
- National Safe Boating Council  
n.d. "Environmental Guide for Personal Watercraft Operation." Available at <<http://www.safeboatingcouncil.org/breakers/guide.html>>. Web site visited Aug. 27, 2001.
- National Transportation Safety Board  
1998 *Personal Watercraft Safety*. Safety Study NTSB/SS-98/01. Washington, DC.
- Nature Conservancy, The  
1995 *NBS/National Park Service Vegetation Mapping Program – Vegetation Classification of Assateague Island National Seashore*. The Nature Conservancy Eastern Regional Office. Boston, MA.

## Noise Pollution Clearinghouse

- 1998 "Environmental Noise, The Invisible Pollutant." By William J. Cavanaugh and Gregory C. Tocci. Available at <<http://www.nonnoise.org/library/envarticle/index.html>>. Web site visited Aug. 23, 2001.

## Noise Unlimited, Inc.

- 1996 "Boat Noise Tests Using Static and Full-Throttle Measurement Measures." Prepared for the New Jersey Department of Law and Public Safety.

## O'Connor, Thomas P.

- 2000 "Small Boat-derived Chemical Contamination in a National Context." In *Impacts of Motorized Boats on Shallow Water Systems*, Science Workshop Abstracts, November 7–8, 2000, Douglass College Center, Rutgers, the State University of New Jersey. Rutgers, NJ.

## O'Connell, Mike

- 2001 "Assateague Island National Seashore Meteorological Monitoring Program 2000 Weather Data Report." Division of Resource Management, Assateague Island National Seashore, Berlin, MD.

## Oregon Department of Environmental Quality

- 1999 "Carbureted 2-stroke Marine Engines. Impacts on the Environment and Voluntary Policy Options to Encourage Their Replacement." Final report. Prepared by Mindy Correll, Pollution Prevention Team. Portland, OR.

## Ortis, J. T., A. C. Hatch, J. E. Weinstein, R. H. Findlay, P. J. McGinn, S. A. Diamond, R. Garrett, W. Jackson, G. A. Burton, B. Allen

- 1998 "Toxicity of Ambient Levels of Motorized Watercraft Emissions to Fish and Zooplankton in Lake Tahoe, California/Nevada, USA." Poster 3E-P005, presented at the 8th Annual Meeting of the European Society of Environmental Toxicology and Chemistry, April 14–18, 1998, University of Bordeaux, Bordeaux, France.

## Personal Watercraft Industry Association

- 2000 "Personal Watercraft and Sound." Available at <[http://www.pwia.org/Snd\\_PWC.html](http://www.pwia.org/Snd_PWC.html)>.

## President, Executive Order

- 2000 "Executive Order 13158: Marine Protected Areas." *Weekly Compilation of Presidential Document* 36, no. 21 (May 29, 2000): 1230–33. Washington, DC. Available on the Internet via GPO Access at <[www.access.gpo.gov](http://www.access.gpo.gov)>.

## Pritchard, D.

- 1960 Salt Balance and Exchange Rate for Chincoteague Bay, *Chesapeake Science* 1(1): 48-57. Quoted in Chris Bohlen, Status and Trends of Eutrophication, Chemical Contamination, Habitat Loss/Modification and Living Resources in the Maryland Coastal Bays.

## Rodgers, James A., and Stephen T. Schweikert

- 2002 "Buffer-zone Distances to Protect Foraging and Loafing Waterbirds from Disturbance by Personal Watercraft and Outboard-powered Boats." *Conservation Biology* 16(1): 216–24.

## Sea-Doo

- 2000 "Personal Watercraft FACTS." Available at <<http://www.ozpwc.com/thefacts.html>>.
- 2001a "Bombardier Announces Revolutionary New O.P.A.S. System." Available at <[http://www.seadoo.com/usa/seadoo\\_today/news/010827.html](http://www.seadoo.com/usa/seadoo_today/news/010827.html)>.
- 2001b "The New 155 hp, 1494 cc 4-TEC, Four-Stroke." Available at <<http://www.seadoo.com>>.

## Stevenson, J. C., and W. C. Dennison

- 2000 "The Potential Impacts of Recreational Boating on Submersed Aquatic Vegetation in Upper Chesapeake Bay." In *Impacts of Motorized Boats on Shallow Water Systems*, Science Workshop Abstracts, November 7–8, 2000, Douglass College Center, Rutgers, the State University of New Jersey. Rutgers, NJ.

## REFERENCES CITED

- Suter, G. W., and C. L. Tsao  
1996 *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota*. Rev. ES/ER/TM-96/R2. Oak Ridge National Laboratory, TN.
- Tahoe Regional Planning Agency  
1999 *Environmental Assessment for the Prohibition of Certain Two-Stroke Powered Watercraft*.
- Tjarnlund, U., G. Ericson, E. Lindersjoo, I. Petterson, and L. Balk  
1995 "Investigation of the Biological Effects of 2-Cycle Outboard Engines' Exhaust on Fish." *Marine Environmental Research* 39: 313–16.
- Tjarnlund, U., G. Ericson, E. Lindersjoo, I. Petterson, G. Akerman, and L. Balk  
1996 "Further Studies of the Effects of Exhaust from Two-Stroke Outboard Motors on Fish." *Marine Environmental Research* 42: 267–71.
- U.S. Census Bureau, U.S. Department of Commerce  
2000a "Populations Estimates for Places: Annual Time Series, July 1, 1990 to July 1, 1999, Maryland." Available at <[http://www.census.gov/populations/estimates/metro-city/placebyco/SC99T8\\_MD.txt](http://www.census.gov/populations/estimates/metro-city/placebyco/SC99T8_MD.txt)>. Web site visited Aug. 27, 2001.
- 2000b "Populations Estimates for Places: Annual Time Series, July 1, 1990 to July 1, 1999, Virginia." Available at <[http://www.census.gov/populations/estimates/metro-city/placebyco/SC99T8\\_VA.txt](http://www.census.gov/populations/estimates/metro-city/placebyco/SC99T8_VA.txt)>. Web site visited Aug. 27, 2001.
- 2001a *Profile of Demographic Characteristics, 200 Census of Population and Housing, Maryland*. Washington, DC.
- 2001b *Profile of Demographic Characteristics, 200 Census of Population and Housing, Virginia*. Washington, DC.
- U.S. Environmental Protection Agency  
1974 "Noise Pollution, An Environmental Resource Packet." Prepared by J. M. Fowler and K. E. Mervine. Dept. of Physics, University of Maryland. College Park, MD.
- 1994 "The Effects of Marine Engine Exhaust Emissions on Water Quality: Summary of Findings of Various Research Studies" Office of Air and Radiation.
- 1996a "Emission Standards for New Gasoline Marine Engines." EPA420-F-96-012. Office of Mobile Sources, Ann Arbor, MI.
- 1996b "Air Pollution Control; Gasoline Spark-Ignition Marine Engines; New Nonroad Compression-Ignition and Spark-Ignition Engines, Exemptions; Rule." *Federal Register* 61 (October 4): 52087–106.
- 1996c *Regulatory Impact Analysis: Control of Air Pollution Emission Standards for New Nonroad Spark-Ignition Marine Engines*. ANR-443. Office of Air and Radiation, Office of Mobile Sources, Engine Programs and Compliance Division, Ann Arbor, MI
- 1997a "Control of Air Pollution; Amendment to Emission Requirements Applicable to New Gasoline Spark-Ignition Engines." *Federal Register* 62 (April 2): 15805–08.
- 1997b "Drinking Water Advisory Fact Sheet: Consumer Acceptability Advice and Health Effects Analysis on MTBE." Office of Water, Washington, DC.
- 1997c "National Recommended Water Quality Criteria — Correction." EPA822-Z-99-001. Office of Water.
- 1997d "Recreational Vehicles, Marine Engines." Region III, Air Protection Division. Available at <[http://www.epa.gov/reg3artrd/vehicltrn/vehicles/recreational\\_vehicles.html](http://www.epa.gov/reg3artrd/vehicltrn/vehicles/recreational_vehicles.html)>.
- 1998 "National Recommended Water Quality Criteria." *Federal Register* 63 (Dec. 10): 68353–64.
- 1999a "Bay Scallop Restoration Project in Chincoteague Bay." Office of Wetlands, Oceans, and Watershed. Washington, DC.



- 1999b "Power Boating and America's Waters." Available at <[http://www.epa.gov/CEIS/atlas/ohiowaters/uses/power\\_boating\\_and\\_america.html](http://www.epa.gov/CEIS/atlas/ohiowaters/uses/power_boating_and_america.html)>.
- 2000a Air Data. Available at <<http://www.epa.gov/air/data/monvals.html>> Web site visited Nov. 8, 2001.
- 2000b "National Recommended Water Quality Criteria — Correction." EPA822-Z-99-001. Office of Water. Washington, DC.
- 2000c "Recreational Vehicles, Marine Engines." Region III, Air Protection Division. Available at <[http://www.epa.gov/reg3artd/vehicltrn/vehicles/recreational\\_vehicles.html](http://www.epa.gov/reg3artd/vehicltrn/vehicles/recreational_vehicles.html)>.
- 2001a "Air Toxics, Hazardous Substances Overview." Available at <<http://www.epa.gov/ttn/atw/hapindex.html>>. Web site visited Sept. 5, 2001.
- 2001b "Methyl Tertiary Butyl Ether (MTBE) Overview." Available at <<http://www.epa.gov/mtbe/faq.htm>>. Web site visited Sept. 5, 2001.
- 2001c "Non-attainment Areas for all Criteria Pollutants." Available at <<http://www.epa.gov/oar/oaqps/greenbk/ancl.html>>. Web site visited Aug. 21, 2001.
- 2001d "Technical Fact Sheet: Benzene." Available at <<http://www.epa.gov/OGWD/dwh/t-voc/benzene.html>>. Web site visited Nov. 8, 2001.
- U.S. Fish and Wildlife Service, U.S. Department of the Interior
- n.d. "Chincoteague National Wildlife Refuge: Wildlife-Birds." Available at <<http://chino.fws.gov/birds.html>>. Web site visited Nov. 7, 2001.
- n.d. "Polycyclic Aromatic Hydrocarbon Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review," by R. Eisler. Report 11. Laurel, MD.
- 1993 *Master Plan, Chincoteague National Wildlife Refuge*. Chincoteague National Wildlife Refuge, Chincoteague Island, VA.
- 1997 "Birds — Chincoteague National Wildlife Refuge, Brochure." Available at <<http://www.assateague.com/data-bird/an-nt-birds.html>>. Web site visited Aug. 2001.
- 2000 "What are Coastal Barriers?" Available at <<http://www.fws.gov/cep/whatbarr.html>>. Web site visited Nov. 7, 2001.
- University of Delaware
- 2000 "Preliminary Assessment of Recreational Boating on Maryland's Coastal Bay's, 1999." University of Delaware Sea Grant Program.
- Virginia Department of Conservation and Recreation
- 1998 "1998 Unified Watershed Assessment and Restoration Priorities." Available at <<http://www.epa.gov/owow/uwa/va.pdf>> Web site visited Aug. 29, 2001.
- Virginia Department of Environmental Quality
- 2001 "Clean Air Summary, Air Quality." Available at <<http://www.deq.state.va.us/air/permitting/xcaa.html>> Web site visited Aug. 22, 2001.
- Virginia Department of Game and Inland Fisheries
- 1999 "Safe Boating, Personal Watercraft (Jet Ski)." Available at <[www.dgif.state.va.us/boating/guide/section8.html](http://www.dgif.state.va.us/boating/guide/section8.html)> Web site visited August 27, 2001.
- 2000 "Boating." Available at <[www.dgif.state.va.us/boating.html](http://www.dgif.state.va.us/boating.html)>. Web site visited Aug. 27, 2001.
- Virginia Institute of Marine Sciences
- 2001 "Bay Grasses (SAV) in Chesapeake Bay and Delmarva Peninsula Coastal Bays." Available at <<http://www.vims.edu/bio/sav/>>. Web site visited Aug. 2001.
- Virginia Polytechnic Institute and State University
- 1992 *Waterfowl Population Assessment at Assateague Island National Seashore*. Department of Fisheries, Blacksburg, VA.

#### REFERENCES CITED

---

Vlasich, Brian

- 1998     Personal Watercraft: Environmental Effects of a ‘Thrill-Craft.’” Claremont Environmental Policy Briefs, Student Edition. Roberts Environmental Center, Claremont McKenna College, Claremont, CA.

White, J. J., J. N. Carroll

- 1998     “Emissions from Snowmobile Engines Using Bio-Based Fuels and Lubricants.” Final Report. Prepared for Montana Department of Environmental Quality, Helena, MT.

Winger, Parley V.

- 2000     “Toxicological Assessment of Aquatic Ecosystems.” In *Impacts of Motorized Boats on Shallow Water Systems*, Science Workshop Abstracts, November 7–8, 2000, Douglass College Center, Rutgers, the State University of New Jersey. Rutgers, NJ.

Wong, D. C. L., W. R. Arnold, G. A. Rausina, E. R. Mancini, and A. E. Steen

- 2001     “Development of a Freshwater Aquatic Toxicity Database for Ambient Water Quality Criteria for Methyl Tertiary-Butyl Ether.” *Environmental Toxicology and Chemistry* 20 (5): 1125–32.

Yaws, C.L., Pan Xiang, and Lin Xiaoyin

- 1993     “Water Solubility Data for 151 Hydrocarbons. *Chemical Engineering*, 100 (n..2): 108–11.

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historic places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

